

MASKER EMITTER BELTS

[Front Matter](#)

[Table of Contents](#)

[List of Illustrations](#)

[Safety Summary](#)

sections

[1](#) Introduction

[2](#) Planning and Preparation

[3](#) Inspection

[4](#) Preventive Maintenance

[5](#) Repairs

MENUS

[UWSHM Chapters](#)

[Main](#)

UNDERWATER SHIP HUSBANDRY MANUAL

CHAPTER 5 MASKER EMITTER BELTS



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TABLE OF CONTENTS

MASKER EMITTER BELTS - CHAPTER 5

Paragraph		Page
SECTION 1. INTRODUCTION		
1.1	PURPOSE	1-1
1.2	SCOPE	1-1
1.3	APPLICABILITY	1-1
1.4	GENERAL INFORMATION	1-1
SECTION 2. PLANNING AND PREPARATION		
2.1	REFERENCE DOCUMENTS	2-1
2.2	SHIP DRAWING INDEX	2-1
2.2.1	Masker Belt Drawings	2-1
2.2.2	Special Equipment Drawings	2-1
2.3	TECHNICAL MANUALS	2-1
2.4	RECORDS AND REPORTS	2-1
2.5	EQUIPMENT AND MATERIALS	2-2
SECTION 3. INSPECTION		
3.1	FREQUENCY OF INSPECTIONS	3-1
3.2	ABNORMAL CONDITIONS	3-1
3.3	INSPECTION PROCEDURES	3-1
SECTION 4. PREVENTIVE MAINTENANCE		
4.1	CLEANING PROCEDURES	4-1
4.2	CLEANING PROCESS INTRODUCTION	4-1
4.3	PREPARATION	4-2
4.3.2	WBD-150N Fluid End Assembly Configuration	4-2
4.4	CLEANING	4-2
4.4.1	External Cleaning of the Masker Belt	4-2
4.4.5	Internal Cleaning of the Masker Belt	4-5
4.4.6	Hydroblast Control for Lance Operation	4-5
4.4.15	External Cleaning of Individual Emitter Belt Holes	4-8
4.4.28	Post Cleaning Inspection	4-9
SECTION 5. REPAIRS		
5.1	TYPES OF REPAIRS	5-1
5.2	IN-PLACE REPAIRS	5-1
5.3	REPLACING THE EPOXY	5-1
5.4	REPLACING SUPPORT STRAPS	5-4
5.5	REPAIR OF HOLES IN FAIRINGS	5-4
5.6	REMOVAL AND REPLACEMENT REPAIRS	5-7
5.7	REMOVAL-REPLACEMENT PROCEDURE NO. 1	5-7
5.8	REMOVAL-REPLACEMENT PROCEDURE NO. 2	5-20

S0600-AA-PRO-050

LIST OF APPENDICES

Appendix		Page
A-1.	Bill of Materials, NAVSEA Drawing 6699567	A-1
A-2.	NAVSEA Drawing 6699567, Masker Belt Cleaning Kit	A-3
A-3.	Masker Belt Cleaning Kit, Sheet 2	A-5

LIST OF ILLUSTRATIONS

Figure		Page
1-1.	Typical Electrically Isolated Masker Emitter Belt Installation.	1-2
4-1.	Fluid End Assembly, Water Jet Model WBD-150N.	4-2
4-2.	Typical Masker Belt Cleaning Equipment Configuration.	4-6
4-3.	Enlarging the Opening for the Hydroblast Lance.	4-7
5-1.	Proper Installation of Epoxy in Fairing Channel.	5-3
5-2.	Support Strap Replacement.	5-5
5-3.	Fairing Plate Hole Repair.	5-6
5-4.	Measurement to Determine Length of Replacement Masker Belt, Procedure 1.	5-9
5-5.	Keel End of Replacement Section of Masker Belt.	5-10
5-6.	Locating Target Plates with the Fairing Channel Template.	5-11
5-7.	Forming Replacement Belt to the Target Plates.	5-12
5-8.	Installation of First Padeye and Repair Clamp Over the Fairing Channel.	5-15
5-9.	Replacement Section of Masker Belt Resting on Repair Clamp Support Pads, Procedure 1.	5-16
5-10.	Replacement Section of Masker Belt Fit-up Configuration, Procedure 1.	5-17
5-11.	Repair Clamps Holding Support Straps in Place.	5-19
5-12.	Measurement to Determine the Length of Replacement Belt, Procedure 2.	5-21
5-13.	Replacement Section of Masker Belt Resting on Repair Clamp Support Pads, Procedure 2.	5-25

LIST OF TABLES

Table		Page
2-1.	List of Materials and Equipment for Masker Belt Repair	2-3
2-2.	Fairing Channel Template (FCT) Length Combinations, 2 Feet to 40 Feet	2-7
4-1.	Dive Locker Materials and Equipment for Masker Belt Cleaning	4-3
4-2.	Masker Emitter Belt Lengths	4-8

CHAPTER 5
MASKER EMITTER BELTS
SAFETY SUMMARY

GENERAL PRECAUTIONS. The following general safety precautions supplement the specific cautions throughout this chapter. These general precautions are related to the task of removing and replacing electrically isolated masker emitter belts. They are precautions that must be understood and applied before and during work on masker belts. In addition to the following precautions, personnel must be familiar with and observe safety precautions set forth in the following publications:

a. OPNAV 5100 series, **Navy Safety Precautions for Forces Afloat**

b. **Naval Ships' Technical Manual (NSTM)**

c. Technical/operating manuals for equipment

d. NAVSEA 0944-LP-9010, **U. S. Navy Diving Manual, Volume 1.**

Do Not Repair or Adjust Alone.

Do not repair or adjust energized equipment alone. The presence of a qualified individual capable of rendering aid is required. Always protect against grounding hazards and make adjustments with one hand free and clear of equipment. Be aware that dangerous electrical hazards can exist because capacitors retain electrical charges even after equipment has been de-energized. Circuits shall be grounded and capacitors shall be discharged.

Equipment in Motion.

Remain clear of equipment in motion. A safety watch will be posted if the equipment requires

adjustment while in motion. The safety watch shall have a full view at all times of the operations and immediate access to controls which are capable of stopping equipment. If at any time the masker belt appears to be moving out of control, stop handling the equipment immediately.

First Aid.

Attend to all injuries, however slight, by obtaining first aid or medical attention immediately.

Resuscitation.

Personnel working with or near high voltage shall be familiar with approved resuscitation methods. Begin resuscitation immediately if someone is injured and stops breathing. A delay could cost the victim's life. Resuscitation procedures shall be posted where electrical hazards exist.

Minimize Relative Motion.

Relative motion is the movement of two or more objects in relation to each other. This poses unique hazards to divers. A common example is a nest of ships swaying and bouncing against each other as a result of wind and wave action. This motion would easily crush a diver caught between two of the ships. To reduce the hazards of relative motion and to simplify the task, suspend the work platform and rigging from fittings on the ship.

WARNINGS. Specific warnings appearing in this chapter are summarized for emphasis and review in the material that follows.

WARNINGS

Operation of the Butterworth Zero Thrust Hydroblast Gun underwater creates significant noise, presenting potential hearing loss hazard to the diver/operator. For this reason, the following regulations govern hydroblast gun use:

Only the Butterworth Zero Thrust Hydroblast Gun has been approved to clear masker belts. No other gun shall be used.

The Hydroblast Gun may only be used in the configuration detailed in NAVSEA Drawing 6699567.

The Hydroblast Gun shall not be operated for more than 85 minutes by any one operator in any 24 hour period.

Operators using the Hydroblast Gun shall wear a Mk21 surface supplied diving helmet.

The HP jet of water discharging from the Hydroblast Gun is potentially dangerous. Keep water jet trained away from divers.

Avoid the ejector discharge while the ejector is operating.

The flexible lance shall not be operated outside the masker belt. Ensure that the lance is inserted at least one foot inside the belt before applying water pressure to the lance.

Diver safety may require instant shutdown of the HP water to the lance. Release the foot pedal to confirm instant loss of HP water to the lance. Reestablish HP water to the lance following successful completion of this test.

When extracting the lance, ensure water pressure is secured when the nozzle is one foot from the cleanout plug or plate. The one foot distance to the nozzle and every five foot mark thereafter shall be clearly marked with tape on the lance. This must be checked by the diver who is performing the cleaning operation.

The foot control valve must be connected and manned when using the flexible lance. When rigging lance hoses, position the foot control valve close to the dive station with constant communication with the dive supervisor. If the lance jams inside the masker belt, ensure that the HP water supply is secured before attempting to remove it.

CAUTIONS. Specific cautions appearing in this chapter are summarized for emphasis and review in the material that follows.

CAUTIONS

The HP jet of water discharging from the Hydroblast Gun is potentially damaging to the epoxy holding the masker belt in place. Keep water jet trained away from epoxy fairing.

Use a thread chaser to dress any damaged threads on the cleanout plug. If screws from a cleanout plate are removed and damaged, replace damaged screws.

If the cleanout plug or plate cannot be removed, hydroblasting of the emitter belt should not be attempted. If cleaning is attempted with the plug or plate installed, further clogging of the emitter belt will occur.

If the masker belt is crushed or damaged, the lance should not be

S0600-AA-PRO-050

inserted past the suspected area. To ensure that this does not happen, attach a cable clamp to the lance at the damaged position measurement.

Note any crushed or otherwise damaged sections of the masker emitter belt, as the lance may become lodged or cut at the damaged area. Record the location of belt damage by taking a measurement from the cleanout plug to the nearest point of damage.

Old repairs on the masker belt can also be a hazard to the passage of the lance, and may cause the lance to jam inside the belt.

To prevent the lance from becoming lodged in the belt due to clogging, clean the belt in 5-foot sections. Do not attempt to pass the lance through the entire belt length on the first sweep.

Great care must be taken during filing not to damage or remove more than the minimum amount of metal. Use a thread chaser to dress any threads that become damaged.

Hydroblasting with high pressure water jet equipment will remove paint. Ensure that the water jet is directed only on the surface of the masker belt, epoxy to be removed, and the interior surfaces of the fairing channel and not on painted surfaces. The Lexan insulator strip behind the masker belt can be damaged if the water jet is aimed directly at it for extended periods.

The repair will be ineffective if the bonding surfaces of the masker belt and fairing channel are not clean or if the new epoxy does not completely fill the void spaces within the fairing channel. Ensure that all bonding surfaces are hydroblasted clean just prior to installing new epoxy and that the new

epoxy completely fills the void spaces within the fairing channel.

Ensure that the new epoxy, when being worked into the void spaces between the masker belt and the interior surfaces of the fairing channel, does not get into and clog any of the air holes of the masker belt.

Each side of the fairing channel is a dry, hollow, preserved structure covered by fairing plates. Cutting into these fairing plates will require extensive repair and preservation. To ensure that the surfaces of the fairing plates remain intact, use extreme caution when grinding off support straps.

Wet welding of the fairings will be in accordance with NSTM Chapter 074, with procedural guidelines and information provided by the [Underwater Ship Husbandry Manual \(UWSHM\) welding chapter](#).

The replacement section of masker belt must maintain its shape along its entire length. Use extreme care to ensure that the replacement section does not crimp or flatten during the bending process.

Attempting to bend the masker belt before it is adequately heated can cause crimping or flattening of the belt. Maintain sufficient heat during the entire bending process.

Each side of the fairing channel is a dry, hollow, preserved structure covered by fairing plates. Cutting into the sides of the fairing channel will require repair and preservation. To ensure that the sides of the fairing channel and the fairing plate surfaces remain intact, use extreme caution when grinding off support straps and cutting the masker belt.

Wet welding of repair clamp padeyes to the fairing plates will be in accordance

S0600-AA-PRO-050

with NSTM Chapter 074, with procedural guidelines and information provided by the [UWSHM welding chapter](#). All padeyes shall be welded on one side only, to allow for easy removal.

The electrical isolation of the belt may be lost if the gap between the keel termination support strap and the masker emitter belt has not been

adequately filled with epoxy. There must be at least 1/4 inch of epoxy between the belt and support strap.

Wet welding of support straps to the fairings will be in accordance with NSTM Chapter 074, with procedural guidelines and information that is provided in UWSHM welding chapter.

Do not penetrate the wall of the fairing plates.

SECTION 1. INTRODUCTION

1.1 PURPOSE.

The purpose of this chapter is to provide technical information and NAVSEA-approved procedures for the underwater inspection, maintenance, and repair of masker emitter belts. Strict adherence to these procedures will provide the best assurance that underwater tasks are safely and efficiently completed and that stringent quality control requirements are met before, during, and after underwater work on masker belts.

1.2 SCOPE.

Section 4 of this chapter provides cleaning procedures for both electronically isolated (epoxied) and welded masker emitter belts. Sections 2, 3, and 5 provide planning, inspection, repair, and replacement procedures for electronically isolated masker emitter belts only. Electronically isolated masker emitter belts, installed as SHIPALT's, are found on ships of the DD-963, DDG-993, and FF-1052/1078 classes. This chapter does not supersede any information contained in equipment technical manuals, the **U.S. Navy Diving Manual**, or the **Naval Ships' Technical Manual**.

1.3 APPLICABILITY.

The primary purpose of this chapter is to provide divers with clear, concise procedures for performing underwater work on masker emitter belts. This chapter also has application as a guide and reference for all personnel involved in planning and performing the work. It can be used by planners to determine the feasibility and scope of underwater work and to prepare quality assurance plans; by repair officers and ship engineers to schedule and coordinate tasks and to maintain records; and by supervisors to monitor underwater work as well as to ensure that a strict quality control program is maintained.

1.4 GENERAL INFORMATION.

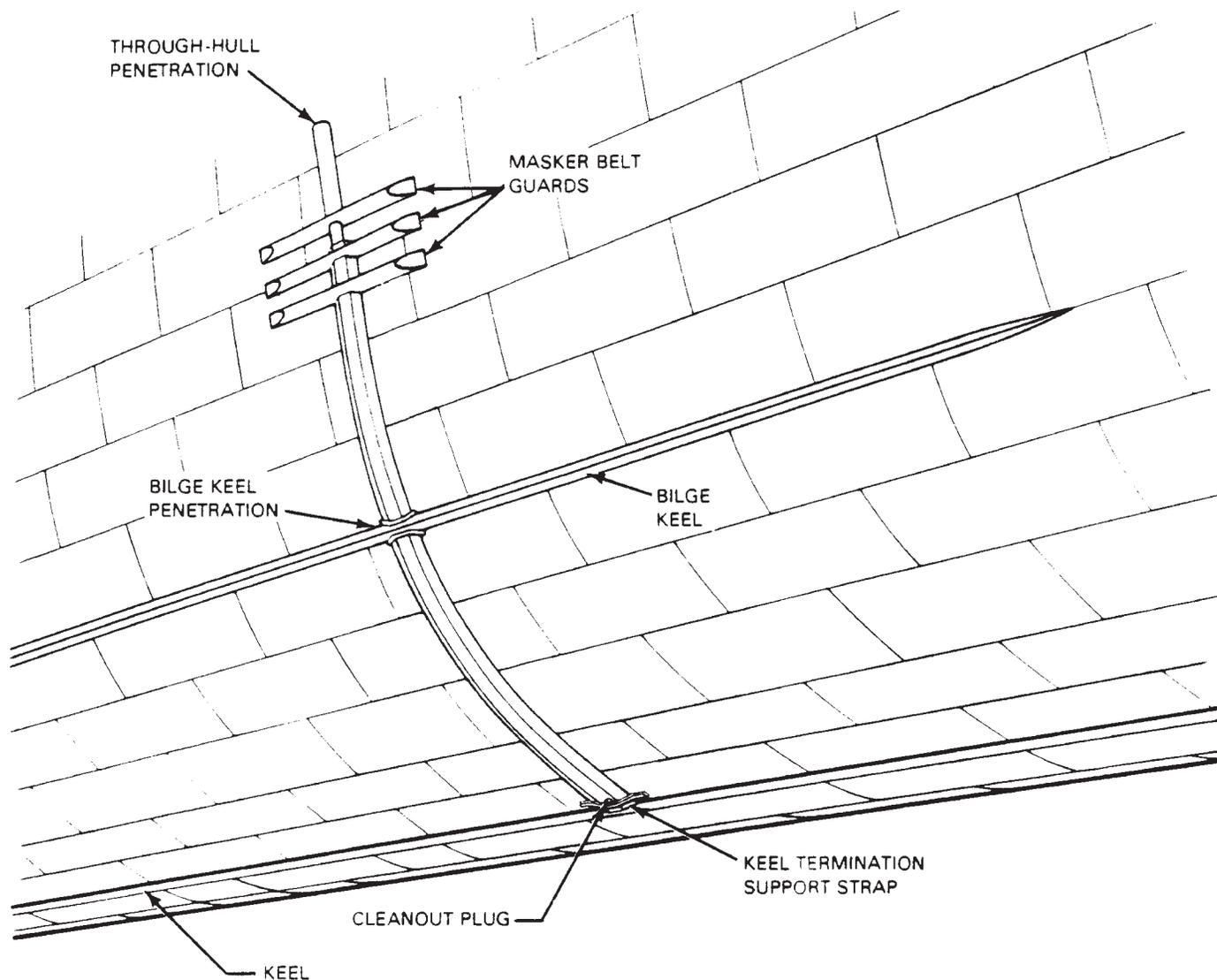
Electrically isolated masker emitter belts are installed at the forward end of the ship's

machinery spaces and run vertically down both sides of the external hull from a point above the waterline to a termination at the keel ([figure 1-1](#)). The masker belt installation consists of a continuous length of flattened 90/10 copper-nickel (CuNi) pipe epoxied into a fairing channel that is welded to the hull of the ship. Where bilge keels obstruct the masker belt installation, an access is cut in the bilge keel to allow the masker belt to pass through. SHIPALT installed masker belts are held in place by epoxy placed in the fairing channel. For additional support, replacement belts are also held in place with insulated support straps welded to the fairing plates.

1.4.1 The epoxy holds the masker belt in place by the mechanical key formed when the epoxy has hardened. The epoxy also serves to electrically isolate the belt from the fairing channel. Electrical isolation from the ship is provided by a Lexan insulator strip placed in the bottom of the fairing channel and bonded with epoxy to a backing plate. The backing plate is welded to the skin of the ship. Electrical isolation of the masker belt allows free copper ions to leach from the CuNi belt and serve as an antifoulant, keeping the exposed portion of the belt free of marine growth.

1.4.2 Air is supplied via a through-hull penetration to the upper end of the belt. The air is emitted through a series of 3/64-inch diameter holes drilled in a specific pattern along the underwater length of the belt.

1.4.3 A cleanout plug is installed in the masker belt just above the keel termination support strap (a metal strap cradling the masker belt at the keel). The cleanout plug is removed to permit periodic flushing of the masker emitter belt system. [Figure 1-1](#) shows the general arrangement and offers a cross-sectional view (section A-A) of an electrically isolated masker emitter belt installation.



SECTION A-A

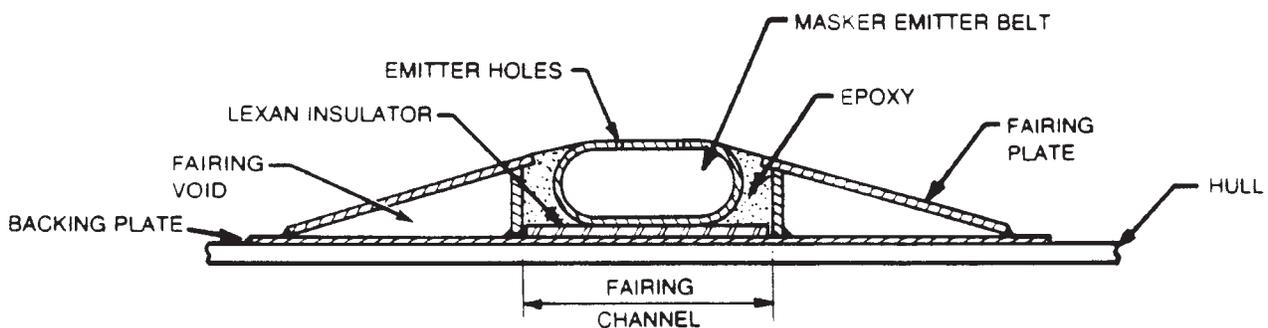


Figure 1-1. Typical Electrically Isolated Masker Emitter Belt Installation.

SECTION 2. PLANNING AND PREPARATION

2.1 REFERENCE DOCUMENTS.

Technical information and engineering data essential to proper planning, preparation, and performance of underwater work on electrically isolated masker emitter belts is available in a variety of source documents. Each document has a unique purpose and provides information important to underwater masker belt tasks.

2.1.1 No single document provides all the information needed to successfully accomplish a task; therefore, all available references must be consulted before beginning the task and should be referred to frequently while performing the task. This section identifies important source documents and the information each of these documents provides. Chapter 2 of this manual, **General Information and Safety Precautions**, provides general guidelines for locating and obtaining reference documents.

2.2 SHIP DRAWING INDEX.

The **Ship Drawing Index (SDI)**, maintained in the ship's log room or technical library, lists all the drawings applicable to that particular ship. Drawing numbers are arranged in the SDI by functional group and they are numerically listed within these groups. Drawings that supplement this chapter and provide essential information are described in the following paragraphs.

2.2.1 Masker Belt Drawings. Drawings which detail the configuration and materials used for the masker emitter belts are available as detailed below:

- a. DD963-513-5918831, **Masker Air Piping, Girth Emitters and Guard Mod Incid to S/A DD963-476K**
- b. FF1052-403-5234571, **Masker Emitters.**

2.2.2 Special Equipment Drawings. NAVSEA 00C5 maintains detailed drawings on the construction and assembly of all special tools and equipment used in masker belt repair.

2.3 TECHNICAL MANUALS.

The **Naval Ships' Technical Manual (NSTM)** and other equipment technical manuals offer equipment operation and maintenance information as well as technical and administrative information and instructions designed to assist in effectively managing ship systems and equipment. The technical manuals of particular interest for masker belt tasks are listed below.

- a. NSTM Chapter 074 (Volume 1), **Welding and Allied Processes**
- b. NSTM Chapter 081, **Waterborne Underwater Hull Cleaning of Navy Ships**
- c. NAVSEA S9251-BP-MMA-010, **Maintenance Manual for Bleed Air System for DD-963 and DDG-993 Classes**
- d. NAVSEA S6220-BW-MMA-010, **Prairie/Masker Air Emission System in FFG-1, FF-1040, FF-1052, and FF-1098 Class Ships.**

2.4 RECORDS AND REPORTS.

The following records and reports, maintained in the ship's log room, often provide important information on masker belts:

- a. Underwater Hull Inspection Reports
- b. Underwater Hull Cleaning Reports
- c. Docking Reports
- d. Underwater Repair or Work Reports

- e. Ship Maintenance & Repair Records.

2.5 EQUIPMENT AND MATERIALS.

NAVSEA Code 00C5 maintains the masker belt repair tools and equipment necessary to repair masker belts on a waterborne ship. [Table 2-1](#) is an inventory of the masker belt repair materials and equipment. [Table 2-2](#) provides the proper combinations of fairing channel template sections for assembling the fairing channel template in required lengths from 2 feet to 40 feet. Replacement sections of copper-nickel (CuNi) masker belt must be

procured through NAVSEA in accordance with the applicable ship's masker emitter belt drawing and shall be positioned on site prior to the task. Quantities indicated in [table 2-1](#) reflect sufficient amounts of each item required to replace a single masker emitter belt. The quantities of material remaining after the belt replacement has been completed will vary, depending on the length of masker emitter belt that was replaced. Hogging lines rigged forward and aft of the masker belt fairing channel will allow for attachment of staging at any location along the girth of the emitter belts.

Table 2-1. List of Materials and Equipment for Masker Belt Repair

Item No.	Quantity	Component Description	Manufacturer (Mfr)	Mfr Part No. (P) NAVSEA Dwg No. (D)
1	2	Peanut Grinder	Fairmont	(P) HU6935
2	2	Peanut Grinder hydraulic hose assemblies, each containing:		
	2	Hydraulic hose 2-wire braid, 1/2 in. ID, 6 ft. long	Aeroquip	(P) 2781-8
	2	Adapter, SAE O-Ring to 37° flare	Aeroquip	(P) 202702-8-8S
	1	Female hydraulic quick disconnect	Aeroquip	(P) 5601-12-10S
	1	Male hydraulic quick disconnect	Aeroquip	(P) 5602-12-10S
	2	Male crimp fitting	Aeroquip	(P) 191101-8-8S
	2	Female crimp fitting	Aeroquip	(P) 191100H8-8S
3	20	Cut-off wheel, 3 x 1/16 x 1/2 in., reinforced	Norton	(P) (3 in.) A60-OBNA2
4	20	Cut-off wheel, 6 x 1/16 x 1/2 in., reinforced	Norton	(P) (6 in.) A60-OBNA2
5	20	Wheel arbor, 1/2 in.	Black & Decker	(P) 39026 (D) 6697852
6	20	Arbor hole insert, 7/8 in.	NAVSEA	(D) 6697852

Table 2-1. List of Materials and Equipment for Masker Belt Repair (Continued)

Item No.	Quantity	Component Description	Manufacturer (Mfr)	Mfr Part No. (P) NAVSEA Dwg No. (D)
7	20	Grinding wheel, 5 x 1/4 x 7/8 in.	Black & Decker	(P) 37125 (D) 6697852
8	50	Flat washer, 1/2 nominal x 1-1/4 in. OD, 18-8 SST	Parker Merrick	(P) 1/2 in. nominal 1-1/4 in. O.D. (D) 6697852
9	8	Lexan, clear, 1/4 x 5-1/2 in. x 8 ft. strips	General Electric	(P) 9034-112
10	100	Drill bit, 3/64 in.	Precision Twist	(P) 10603 or equivalent
11	1	Hole tap, 1-1/2 in. diameter, NPT	Various	N/A
12	7	Repair clamp	NAVSEA	(D) 6697860
13	16	Padeye	NAVSEA	(D) 6697860
14	10	Permanent strap	NAVSEA	(D) 6697890
15	6	Adjustable fairing channel template section, 2 ft.	NAVSEA	(D) 6697853 (D) 6697856
16	6	Adjustable fairing channel template section, 3 ft.	NAVSEA	(D) 6697854 (D) 6697856
17	6	Adjustable fairing channel template section, 4 ft.	NAVSEA	(D) 6697855 (D) 6697856
18	4 at 7.5 in.; 4 at 13.5 in.	Masker belt repair insert	NAVSEA	(D) 6697863
19	3	Cleanout plug and boss assembly	NAVSEA	(D) 6697851

Table 2-1. List of Materials and Equipment for Masker Belt Repair (Continued)

Item No.	Quantity	Component Description	Manufacturer (Mfr)	Mfr Part No. (P) NAVSEA Dwg No. (D)
20	4	End plate material, 3/16 in. thk. x 3 x 6 in. 90/10 copper-nickel plate	Common Item	None
21		Associated fairing channel template spare parts:		None
	8	Stud, 1/2-13 UNC- 2A x 1-3/4 long, 18-8 SST	Common Item	None
	16	Nut, 1/2-13 UNC, 18-8 SST	Parker Merrick	(P) 1/2-13 UNC 18-8 SST
	16	Washer, 1/4 in. nominal x 1-3/4 in. OD	Parker Merrick	(P) 1/4 in. nominal (P) 1-3/4 in. OD
22		Sea Goin 'Poxy Putty:	Permalite Plastics	(P) 1350 HD
	20	Epoxy resin, 1 gallon can		
	20	Epoxy hardener, 1 gallon can		
23	100	Rubber glove (disposable)	Common Item	None
24	20	Plastic putty knife, 5 in. nominal blade width	Common Item	None
25	30	Polypropylene shallow tray, 12 x 16 x 3/4 in.	Common Item	None
26	1	Center punch, 14 in. stock, 5/64 in. point	Starrett	(P) 264B or equivalent
27	1	Scratch awl	Stanley	(P) 69-122 or equivalent

Table 2-1. List of Materials and Equipment for Masker Belt Repair (Continued)

Item No.	Quantity	Component Description	Manufacturer (Mfr)	Mfr Part No. (P) NAVSEA Dwg No. (D)
28	1	50 ft. tape measure fiberglass tape in plastic (case and reels made from polystyrene)	Lufkin	(P) 703 or equivalent
29	1	Utility knife	Stanley	(P) 10-299 or equivalent
30	5	Soapstone	Common Item	None
31	3	Grease pencil	Common Item	None
32	2	2-1/2 in. hole saw; 1/4 in. mandrel, 1/4 in. pilot drill	Starrett	(P) H0214-A2 or equivalent
33	3 rolls	Polyken tape, 2 in. wide white	Polyken	(P) 827
34	1	Wedge, 5 lbs. wt. 9 in. long, 1-3/4 in. sq. head, 2 in. bit width	McMaster-Carr	(P) 5948A3 or equivalent
35	1	Sealant gun, Model 250-8	Semco	(P) 220848

S0600-AA-PRO-050

Table 2-2. Fairing Channel Template (FCT) Length Combinations, 2 Feet to 40 Feet

Assembly Length (Ft)	FCT Combination in Proper Sequence	Assembly Length (Ft)	FCT Combination in Proper Sequence
2	2	22	4-2-4-2-4-2-4
3	3	23	2-4-2-4-2-4-2-3
4	4	24	2-4-2-4-2-4-2-4
5	3-2	25	3-2-3-2-4-2-4-2-3
6	4-2	26	3-2-4-2-4-2-4-2-3
7	2-3-2	27	3-2-4-2-4-2-4-2-4
8	2-4-2	28	4-2-4-2-4-2-4-2-4
9	3-2-4	29	2-3-2-4-2-4-2-3-2-3-2
10	4-2-4	30	4-2-4-2-4-2-4-2-4-2
11	2-3-2-4	31	3-2-3-2-3-2-3-2-3-2-4-2
12	2-4-2-4	32	3-2-3-2-3-2-3-2-4-2-4-2
13	3-2-3-2-3	33	3-2-3-2-3-2-4-2-4-2-4-2
14	4-2-3-2-3	34	3-2-3-2-4-2-4-2-4-2-4-2
15	4-2-4-2-3	35	3-2-4-2-4-2-4-2-4-2-4-2
16	4-2-4-2-4	36	4-2-4-2-4-2-4-2-4-2-4-2
17	2-3-2-4-2-4	37	3-2-3-2-3-2-3-2-3-2-4-2-4-2
18	2-4-2-4-2-4	38	3-2-3-2-3-2-3-2-4-2-4-2-4-2
19	3-2-4-2-3-2-3	39	3-2-3-2-3-2-4-2-4-2-4-2-4-2
20	4-2-4-2-3-2-3	40	3-2-3-2-4-2-4-2-4-2-4-2-4-2
21	4-2-4-2-4-2-3		

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SECTION 3. INSPECTION

3.1 FREQUENCY OF INSPECTIONS.

Divers shall inspect the electrically isolated masker emitter belts during periodic hull inspections, after cleaning, and whenever masker belt damage is suspected.

3.2 ABNORMAL CONDITIONS.

Masker belt inspections shall include examination for the following types of physical damage: loose, missing, or excess epoxy; crushed, twisted, or missing sections of masker belt; and displaced masker belt, sprung from the fairing channel. Specific abnormal masker belt conditions and their probable causes are:

- a. Plugged emitter holes, usually caused by marine fouling;
- b. Loose or missing cleanout plug, usually caused by improper installation;
- c. Loose, missing, or excess epoxy, usually caused by improper application of the epoxy while in dry dock;
- d. Holes in the fairing plates, most often caused by the improper welding or the breaking off of support straps for the replacement belts;
- e. Support straps missing insulation, caused by the forces that are introduced by the

ship when it is underway;

f. Sprung (out of the fairing channel) masker belt, usually caused by improper bending of the belt and by the forces introduced by the ship underway;

g. Crushed, twisted, torn, or missing section of the masker belt, usually the result of continued damage to a sprung masker belt from the forces introduced by the ship underway or by a collision;

h. Epoxy trapped between the masker belt and the Lexan insulation strip, usually caused by excessive epoxy in the fairing channel during drydock installation.

3.3 INSPECTION PROCEDURES.

Divers may use any inspection procedure which ensures that the entire underwater portion of the masker emitter belt and the exposed epoxy are visually observed. Wooden or plastic scrapers should be used to remove superficial fouling in the way of the masker belt and the epoxy. The location, extent, and type of fouling removed from the masker belt or the epoxy surface should be noted and reported to appropriate personnel. The location and extent of masker belt damage or missing epoxy should be measured and reported with reference to the keel termination of the belt.

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SECTION 4. PREVENTIVE MAINTENANCE

4.1 CLEANING PROCEDURES.

All masker belts, be they electrically isolated or not, lose operational effectiveness if marine growth or other fouling blocks air emission holes in the belt, preventing proper bubble formation. Cleaning is the only preventive maintenance authorized for the masker belts. Cleaning of masker belts is usually accomplished by divers during the scheduled underwater hull cleaning operations or when air flow measurements indicate that the belt is becoming fouled. After a hull inspection report has been completed and the degree of masker belt fouling has been determined, the local Hull Cleaning Representative will assign masker belt cleaning duties to qualified dive personnel. The cleaning procedures provided in this section, accomplished using NAVSEA Drawing 6699567, Masker Belt Cleaning Kit (Appendix A); and equipment listed in [table 4-1](#), will allow Navy divers to return fouled belts to operational standards.

4.1.1 Cleaning of masker belts should be performed in accordance with this chapter as authorized in NSTM Chapter 081, **Waterborne Underwater Hull Cleaning of Navy Ships.**

4.2 CLEANING PROCESS INTRODUCTION.

All Shore and Afloat Intermediate Maintenance Activity (SIMA/IMA) divers should be capable of carrying out the masker emitter belt cleaning process using special equipment supplied by the local Boiler Repair Shop and NAVSEA 00C. All other equipment can be supplied by the divers. The complete process will take between two and four days, depending on the degree of fouling to the belts and the size of the ship.

4.2.1 The cleaning process is divided into three main operations. The first involves external cleaning of the belt using a hand held hydraulic grinder. The second uses a diesel

driven WBD-150N water jet machine connected to a flexible lance for interior wall cleaning, with access gained via the cleanout plug opening. The third operation involves using the Butterworth Zero Thrust Hydroblast Gun, modified in accordance with NAVSEA Drawing 6699567, to clean individual emitter holes.

WARNING

Operation of the Butterworth Zero Thrust Hydroblast Gun underwater creates significant noise, presenting potential hearing loss hazard to the diver/operator. For this reason, the following regulations govern hydroblast gun use:

Only the Butterworth Zero Thrust Hydroblast Gun has been approved to clean masker belts. No other gun shall be used.

The Hydroblast Gun may only be used in the configuration detailed in NAVSEA Drawing 6699567.

The Hydroblast Gun shall not be operated for more than 85 minutes by any one operator in any 24 hour period.

Operators using the Hydroblast Gun shall wear a Mk21 surface supplied diving helmet.

4.2.2 In addition to the WBD-150N water jet machine, the specialized cleaning equipment required is contained in a dedicated masker belt cleaning kit, see Appendix A. Additional standard equipment held by the divers is listed in [table 4-1](#). Supporting services required are adjacent fresh and saltwater supplies.

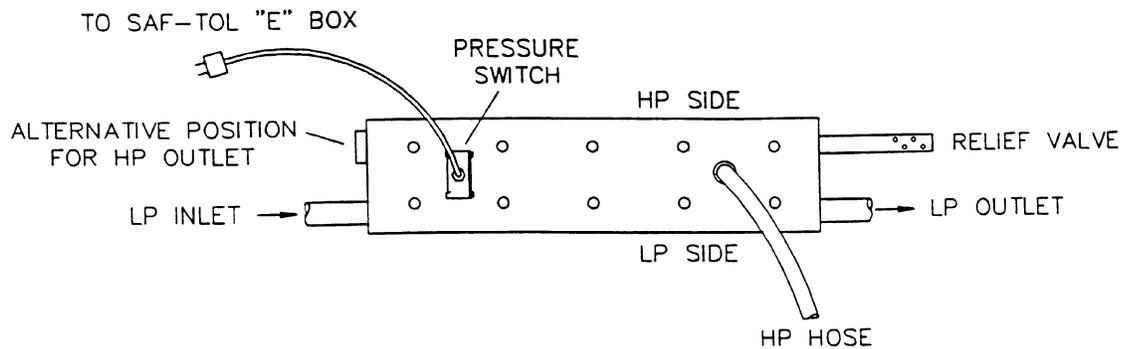


Figure 4-1. Fluid End Assembly, Water Jet Model WBD-150N.

4.3 PREPARATION.

NOTE

The activity responsible for each step in the cleaning procedure is identified in parenthesis - diver (DV), topside (TOP).

4.3.1 (TOP) Ensure that the hose for the hydraulic tools is long enough to clean the entire length of the masker emitter belt.

4.3.2 WBD-150N Fluid End Assembly Configuration. (TOP) To accommodate a variety of uses, there are three HP fittings on the fluid end assembly of the WBD-150N pump. The easiest configuration for the fittings is the arrangement in figure 4-1. This will ensure that the pressure switch is screwed into the fluid end assembly correctly. The electrical cable leading from the pressure switch must be plugged into the SAF-TOL "E" socket on the speed control motor in the place of the standard SAF-TOL "E" plug.

4.3.3 (TOP) Shut the emitter belt air isolation valve and (if fitted) the steam out connection valve. Danger tag the valves shut.

4.3.4 (DV) Rig parallel hogging lines a distance of one foot to either side of the belt to be cleaned.

4.4 CLEANING.

4.4.1 External Cleaning of the Masker Belt.

4.4.2 (DV) Using a hand-held hydraulic grinder with a D-3 or D-5 marine cleaning disk, externally scrub the emitter belt from the waterline to the keel. This cleaning should remove the hard white calcium layer as well as marine fouling, and produce a shiny surface so that the emitter holes can be easily determined.

CAUTION

Note any crushed or otherwise damaged sections of the masker emitter belt, as the lance may become lodged or cut at the damaged area. Record the location of belt damage by taking a measurement from the cleanout plug to the nearest point of damage.

4.4.3 (DV) Wire brush any marine growth or encrustation on and immediately around the cleanout plug or plate.

Table 4-1. Dive Locker Materials and Equipment for Masker Belt Cleaning

Item No.	Quantity	Component Description	Manufacturer (Mfr)	Mfr Part No. (P) NAVSEA Dwg No. (D)
1	1	Wire brush, hand held	Commercial	
2	1	Key, socket head screw hex, 3/4 in.	Commercial	
3	2	Wrench, spanner 1 1/2 in.	Commercial	
4	1	Wrench, pipe 18 in.	Commercial	
5	2	Screwdriver flat tip, 6 in. flat tip, 8 in., square shaft	Commercial	
6	1	Grinder, hydraulic	Stanley	(P) GR24 or GR29*
7	1	Wire brush, type D	Abtex Corp.	(P) BAA51ES*
8	1	Marine cleaning disk type D-3 or D-5	3 M Company	(P) Scotch-Brite*
9	1	Bear paw	Bear Paw Magnetic Tools	(P) 600CA*
10	2	Hogging lines nylon, 1/4"	Commercial	
11	1	Water jet machine	Butterworth	(P) WBD-150N*
12	1	Flexible lance 10,000 wp 3/8 in. OD x 50 ft	Jetstream	(P) 25515-50
13	1	Breaker bar, 1 in. sq. drive	Commercial	
14	1	Wrench set, open end combination 1/4 in through 1 1/8 in.	Commercial	
15	1	Thread chaser, 1 1/2 in. NPT	Commercial	

Table 4-1. Dive Locker Materials and Equipment for Masker Belt Cleaning (Continued)

Item No.	Quantity	Component Description	Manufacturer (Mfr)	Mfr Part No. (P) NAVSEA Dwg No. (D)
16	1	Wrench, thread chaser	Commercial	
17	As required	Tags, safety, danger		
18	1	Reducer 1 1/2 in. to 1 1/4 in. NPT	Commercial	
19	1	Nipple 1 1/4 in. NPT, 3 in. long	Commercial	
20	roll	Tape, teflon 1/4 in. wide	Commercial	
21	1	Tubing, double male reducer 3/4 in. NPT x 1/4 in.	Commercial	
22	As required	Gasket material, 1/16 in. rubber	Commercial	
23	1	Hydraulic Power Unit, MOD II	NAVSEA	(D) 5366557*
24	1	Hose reel, 1/4 hose	NAVSEA	(D) 5366566*
25	1	File, half round bastard	Commercial	

* - or equivalent

4.4.4 (DV) Remove the cleanout plug or plate from the bottom of the emitter belt. If the cleanout plug or plate is difficult to remove, use good engineering practices to extract it without damaging the ship's fittings.

CAUTION

Use a thread chaser to dress any damaged threads on the cleanout plug. If screws from a cleanout plate are removed and damaged, replace damaged screws.

If the cleanout plug or plate cannot be removed, hydroblasting of the emitter

belt should not be attempted. If cleaning is attempted with the plug or plate installed, further clogging of the emitter belt will occur.

If the masker belt is crushed or damaged, the lance should not be inserted past the suspect area. To ensure that this does not happen, attach a cable clamp to the lance at the damaged position measurement.

Old repairs on the masker belt can also be a hazard to the passage of the lance, and may cause the lance to jam inside the belt.

4.4.5 Internal Cleaning of the Masker Belt

4.4.6 Hydroblast Control for Lance Operation. (TOP) Connect lance, hoses and the foot control valve to the HP outlet on the fluid end assembly of the water jet machine. When inserted into the masker belt, allow sufficient hose length for the lance to reach to the upper end of the masker belt (see [table 4-2](#) for masker belt lengths). The 37-foot lance is used for plate access belts, while the 50-foot lance is used for plug access belts. Fit the 4/18 hole nozzle onto the lance using the pin and punch supplied with the belt cleaning kit. Clamp eight floats to the first 50-foot section of hose ([figure 4-2](#)).

4.4.7 (TOP/DV) When the diver has inserted the lance one foot into the masker belt, start the pump, allowing 30 seconds for the air to bleed out of the system.

WARNING

The flexible lance shall not be operated outside the masker belt. Ensure that the lance is inserted at least one foot inside the belt before applying water pressure to the lance.

Diver safety may require instant shutdown of the HP water to the lance. Release the foot pedal to confirm instant loss of HP water to the lance. Reestablish HP water to the lance following successful completion of this test.

When extracting the lance, ensure water pressure is secured when the nozzle is one foot from the cleanout plug or plate. The one foot distance to the nozzle and every five foot mark thereafter shall be clearly marked with tape on the lance. This must be checked by the diver who is performing the cleaning operation.

The foot control valve must be connected and manned when using the flexible lance. When rigging lance hoses,

position the foot control valve close to the dive station with constant communication with the dive supervisor. If the lance jams inside the masker belt, ensure that the HP water supply is secured before attempting to remove it.

4.4.8 (DV) Experience has shown that very occasionally the length of the internal threaded part of the plug access assembly is longer than the design specifications. In these cases, it is sometimes not possible to move the lance around the base of the plug access and up into the belt ([see \(a\), figure 4-3](#)).

CAUTION

Great care must be taken during filing not to damage or remove more than the minimum amount of metal. Use a thread chaser to dress any threads that become damaged.

4.4.9 (DV) To overcome this problem, use the hand file ([item 25, table 4-1](#)) to carefully remove only the minimum amount of metal necessary from the base of the internal neck of the plug ([see \(b\), figure 4-3](#)). This will ease the passage of the lance ([see \(c\), figure 4-3](#)).

4.4.10 (TOP) Once the foot control valve has been activated, water pressure will rise until the pressure switch is activated. The pressure switch will then increase the water jet machine's speed of operation to 1600 - 1700 rpm. This will in turn increase the HP outlet pressure to working pressure. The high speed linkage on the governor should be adjusted to give an output pressure gauge reading of 9,000 - 10,000 psi. To achieve this, it may be necessary to adjust the pressure switch.

4.4.11 (DV) Once inside and energized, the lance should make several sweeps from the bottom to the top of the belt. This will ensure that even the most heavily fouled belts will be cleaned fully. The lance should progress at one foot per minute.

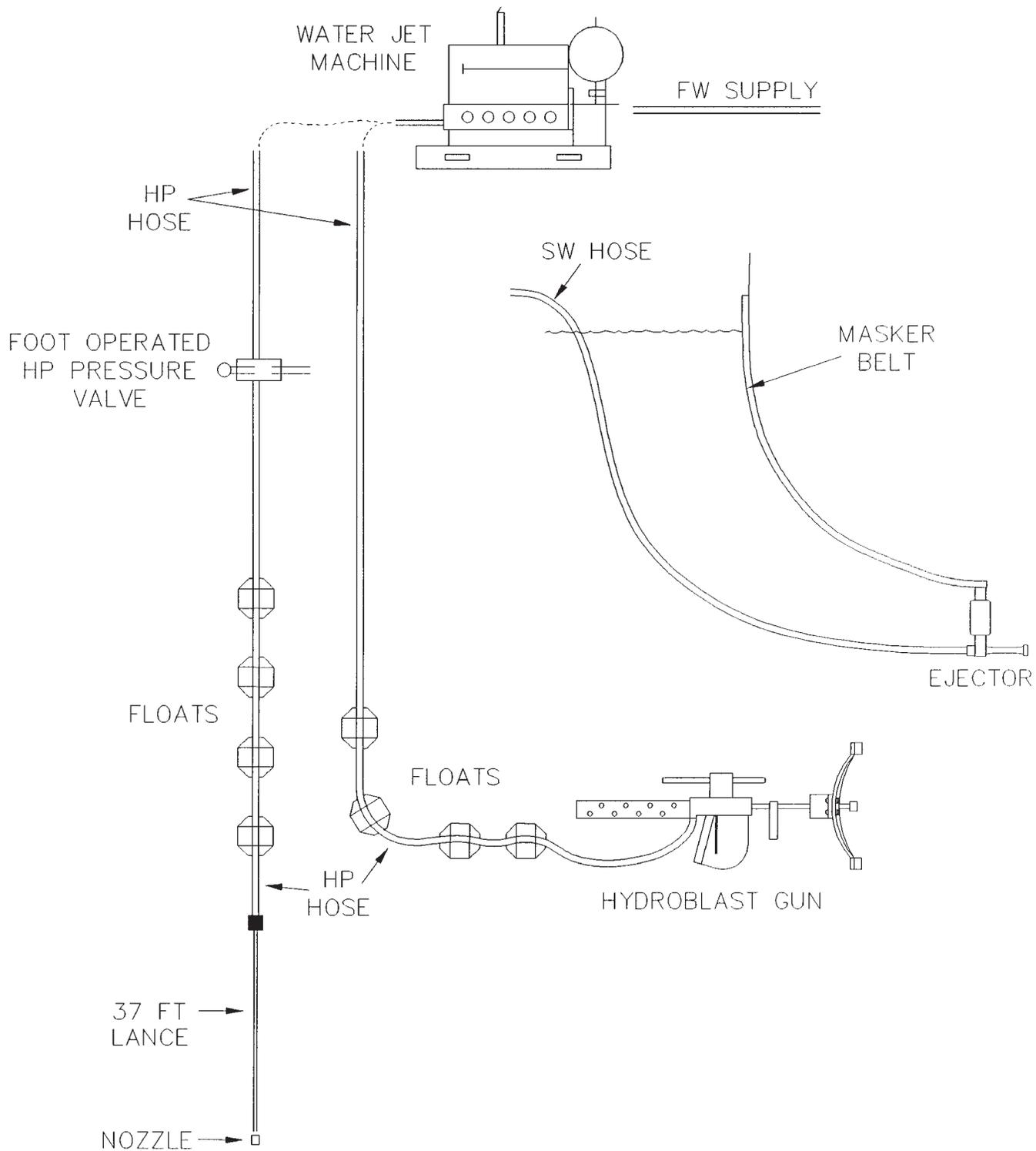


Figure 4-2. Typical Masker Belt Cleaning Equipment Configuration.

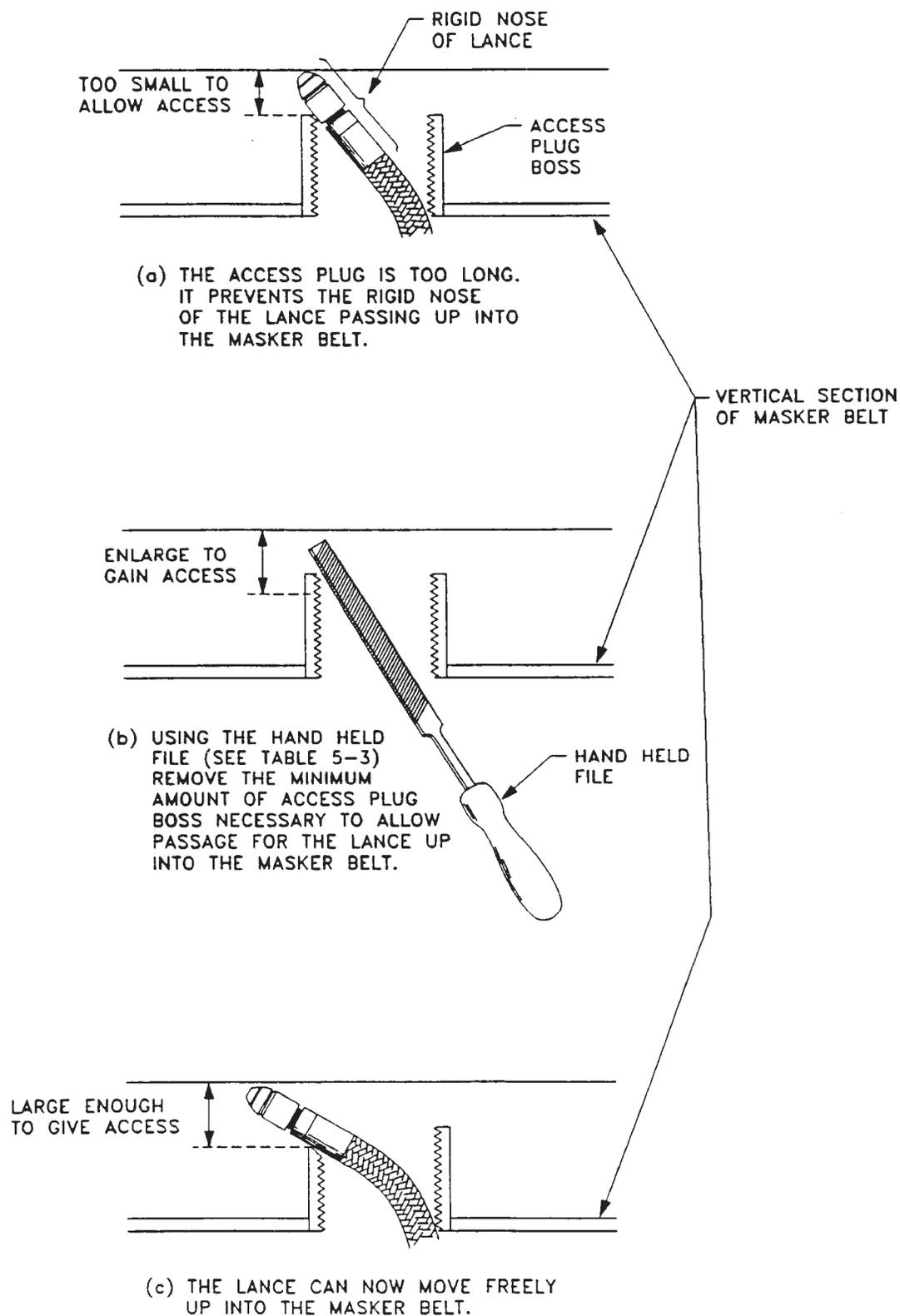


Figure 4-3. Enlarging the Opening for the Hydroblast Lance.

Table 4-2. Masker Emitter Belt Lengths

SHIP CLASS	BELT LENGTH (KEEL TO WATERLINE)
DD-963	34 FEET
FF-1052	30 FEET
FFG-7	24 FEET
CG-47	34 FEET
DDG-51	42 FEET

CAUTION

To prevent the lance from becoming lodged in the belt due to clogging, clean the belt in 5-foot sections. Do not attempt to pass the lance through the entire belt length on the first sweep.

WARNING

Shut down the pump before the lance is removed from the belt.

4.4.12 (DV) Ensure that the entire length of the masker belt is cleaned from keel to waterline. Use the distance markings on the lance and the belt lengths provided in [Table 4-2](#) for the belts being cleaned.

4.4.13 (TOP/DV) Finally, proceed as follows to clean out any excess loose fouling that may have collected or lodged in the belt during the lance operation. Attach the 1-1/2-inch ejector suction pipe to the cleanout opening using the 1-1/2 to 1-1/4-inch reducer nipple if required. If a cleanout plate was removed, install the adapter plate and attach the ejector assembly. Attach the firehose to the ejector inlet and pier firemain ([figure 4-2](#)).

WARNING

Avoid the ejector discharge while the ejector is operating.

4.4.14 (TOP) Open the pier firemain valve and begin to flush the emitter belt through the ejector for at least five minutes. Secure the firemain.

4.4.15 External Cleaning of Individual Emitter Belt Holes

4.4.16 (TOP) Remove the high pressure lance from the high pressure water hose and, in its place, connect the Modified Butterworth Zero Thrust Hydroblast Gun, in accordance with NAVSEA Drawing 6699567. Clamp two floats close to the hose connection with the gun and add additional floats as required to maintain the buoyancy of the hose.

4.4.17 (TOP) On the pier, hold and point the Hydroblast Gun in a safe direction (fore and aft). Start and engage the pump. Allow air to clear through the hose line until a jet of water discharges through both the fore and aft thrust nozzles. Slowly close the bleed valve located on the fluid end assembly of the WBD-150N pump, until the pressure switch operates bringing the engine speed up to the required level. Adjust the high speed linkage on the governor so that a maximum supply pressure of 9,200 psi is recorded on the high pressure gauge. If the machine overrevs and the relief operates, then screw back on the high speed linkage and repeat setting up the bleed valve. As a safety check release the trigger to confirm that the water pressure reduces quickly to a safe level. The hydroblast machine is now set up for constant operation. The machine will reduce and increase revs automatically when the diver operates the trigger.

WARNING

The HP jet of water discharging from the Hydroblast Gun is potentially dangerous.

Keep water jet trained away from divers.

CAUTION

The HP jet of water discharging from the Hydroblast Gun is potentially damaging to the epoxy holding the masker belt in place. Keep water jet trained away from epoxy fairing.

4.4.18 (TOP) Open the pier firemain valve supplying the ejector.

4.4.19 (DV) Flush water through the emitter belt in the same manner detailed in [paragraph 4.4.14](#). While the belt is being flushed, the diver cleans the holes using the Hydroblast Gun. Beginning at the top of the belt, hydroblast each hole, working down toward the keel using the bear paw clamp and hogging line as support.

4.4.20 (DV) If the holes are not clear, the diver must repeat the hole cleaning operation.

4.4.21 (TOP) When the belt is clean, shut off the water supply and remove the ejector equipment in reverse order as installed.

4.4.22 (DV) If the cleanout opening had a plug, wrap teflon tape around the threads of the plug and reinstall it.

4.4.23 (DV) If the cleanout opening had a plate, install screws holding the cleanout plate in place. Tighten the screws in a crossover pattern to ensure even tightening of the cleanout plate.

4.4.24 (DV) Repeat the entire cleaning procedure for each emitter belt to be cleaned. When all belts are cleaned, return all equipment to the surface.

4.4.25 (TOP) Clear tags from the belt air isolation and steamout connection valves.

4.4.26 (TOP) Inform ship's force or cognizant repair activity representative that the underwater task has been completed.

4.4.27 (TOP) Clean all equipment by rinsing with fresh water. Apply a water displacing lubricant to the lance and hose end connections and a light petroleum based cleaning fluid to the lance nozzle. Thoroughly inspect all equipment for damage and restow in the basket provided. Return the WBD-150N water jet machine to its original configuration.

NOTE

Any alterations to the above procedure must be approved by NAVSEA 00C5.

4.4.28 Post Cleaning Inspection. (TOP) The effectiveness of the cleaning operation can only be verified by ships' force when operating the bleed air system and checking flow rates in accordance with the relevant MRC procedure. Divers can also estimate the percentage of clean holes while the belt is supplied with bleed air.

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SECTION 5. REPAIRS

5.1 TYPES OF REPAIRS.

Divers may perform either in-place repairs or removal-and-replacement repairs on the electrically isolated masker emitter belts. In-place repairs are those repairs that can be accomplished underwater without removing or replacing any portion of the masker belt. Removal-and-replacement repairs require that a damaged section of the masker belt be removed and replaced or that a missing section be replaced. Since all underwater masker belt repairs require the joint effort and close coordination of divers (DV) and topside support personnel (TOP), the activity responsible for each step in these procedures is identified in parentheses at the beginning of the procedural step.

5.2 IN-PLACE REPAIRS.

The only in-place repairs authorized are the replacement of missing epoxy in the fairing channel, replacement of support straps, and repair of holes in the fairing plates. Replacement of the missing epoxy and of support straps are authorized only when preliminary inspection indicates the existing belt is in place and undamaged.

5.2.1 Reattachment of a section of masker belt which has sprung free from the fairing channel is not recommended. Although the section of masker belt which has sprung free from the fairing channel is in one piece, it is usually so deformed that reattachment is far more difficult than cutting the section out and replacing it.

5.3 REPLACING THE EPOXY.

Replacement of missing epoxy is accomplished in four distinct steps: cleaning, mixing the epoxy, installing the epoxy, and fairing the epoxy to the fairing channel. During the cleaning phase, if the diver observes the belt is not properly seated in the fairing channel due to epoxy trapped between the belt and the Lexan insulation strip, removal of trapped epoxy is

required to properly seat the belt. Proper seating of the belt will normally require installation of the repair clamps as discussed in the Removal and Replacement Repairs (paragraphs 5.7.27 to 5.7.31; 5.8.23 to 5.8.27). Where large sections of epoxy are missing, the belt should be supported in position with the special repair clamps prior to installing epoxy.

CAUTION

Hydroblasting with high pressure water jet equipment will remove paint. Ensure that the water jet is directed only on the surface of the masker belt, the epoxy, and the interior surfaces of the fairing channel and not on painted surfaces. The Lexan insulator strip behind the masker belt can be damaged if the water jet is aimed directly at it for extended periods.

5.3.1 (DV) Use an approved water jet system, as specified in NSTM Chapter 081, to thoroughly clean the bonding surfaces of the masker belt and the interior of the fairing channel and to remove all loose or damaged epoxy.

NOTE

New epoxy will bond effectively to clean surfaces and to any remaining intact epoxy. All the epoxy in the fairing channel should be considered of questionable value, however, since the masker belt repair was made necessary by the failure of much of that epoxy. If the existing epoxy is easy to remove, remove it and replace it with new epoxy.

5.3.2 (TOP) Prepare a 50/50 mixture of the two-part epoxy in small batches (1/4 gallon or less of each part). Mixing the epoxy in small batches will achieve the proper working consistency for the maximum working time available.

5.3.3 (TOP) Use putty knives to mix and churn the epoxy continuously while keeping the

knives wet with water. The epoxy will slowly thicken until a putty-like consistency is achieved. To ensure the maximum working time, spread the epoxy as thin as possible on a flat, smooth surface (i.e., plastic tray) before passing it to the diver.

NOTE

If the epoxy is transferred to the diver before it passes the pinch test, the seawater will cool the epoxy reaction and it will remain in an unworkable consistency too long to accomplish the needed repair successfully.

The epoxy is temperature dependent; recommended ambient temperature range is between 70 and 80 degrees Fahrenheit.

5.3.4 (TOP) When the epoxy can be pinched and retain its shape, immediately transfer the epoxy to the diver. Experience indicates that 10 to 15 minutes is the maximum working time available for the epoxy in this state.

CAUTION

The repair will be ineffective if the bonding surfaces of the masker belt and fairing channel are not clean or if the new epoxy does not completely fill the void spaces within the fairing channel. Ensure that all the bonding surfaces are hydroblasted clean just prior to installing new epoxy and that the new epoxy completely fills the void spaces within the fairing channel.

Ensure that the new epoxy, when being worked into the void spaces between the masker belt and the interior surfaces of the fairing channel, does not get into and clog any of the air holes of the masker belt.

5.3.5 (DV) Fasten Polyken tape over the air holes of the masker emitter belt to keep them clear during installation of new epoxy.

5.3.6 (DV) Tear off small chunks of mixed epoxy from the batch and work it into the void spaces between the masker belt and the interior surfaces of the fairing channel, as shown in [figure 5-1](#). Continue pushing the epoxy into the void spaces to prevent gaps and sags from forming.

5.3.7 (TOP/DV) Repeat the mixing and installation procedures as necessary until all missing epoxy is replaced. Ensure that epoxy is replaced in the keel termination area.

NOTE

The brief working times available for the epoxy require topside personnel to mix batches in succession so that workable epoxy is always available for the diver.

5.3.8 (DV) Continue to work epoxy until initial curing indicates sagging will not occur. Ensure that the top surface of the epoxy is faired to the channel, using a putty knife.

5.3.9 (DV) Allow the epoxy to cure for 24 hours.

NOTE

Support strap replacement is authorized only when preliminary inspection indicates that the existing masker emitter belt is in place and undamaged.

CAUTION

Each side of the fairing channel is a dry, hollow, preserved structure covered by fairing plates. Cutting into these fairing plates will require extensive repair and represervation. To ensure that the surfaces of the fairing plates remain intact, use extreme caution when grinding off support straps.

5.4 REPLACING SUPPORT STRAPS.

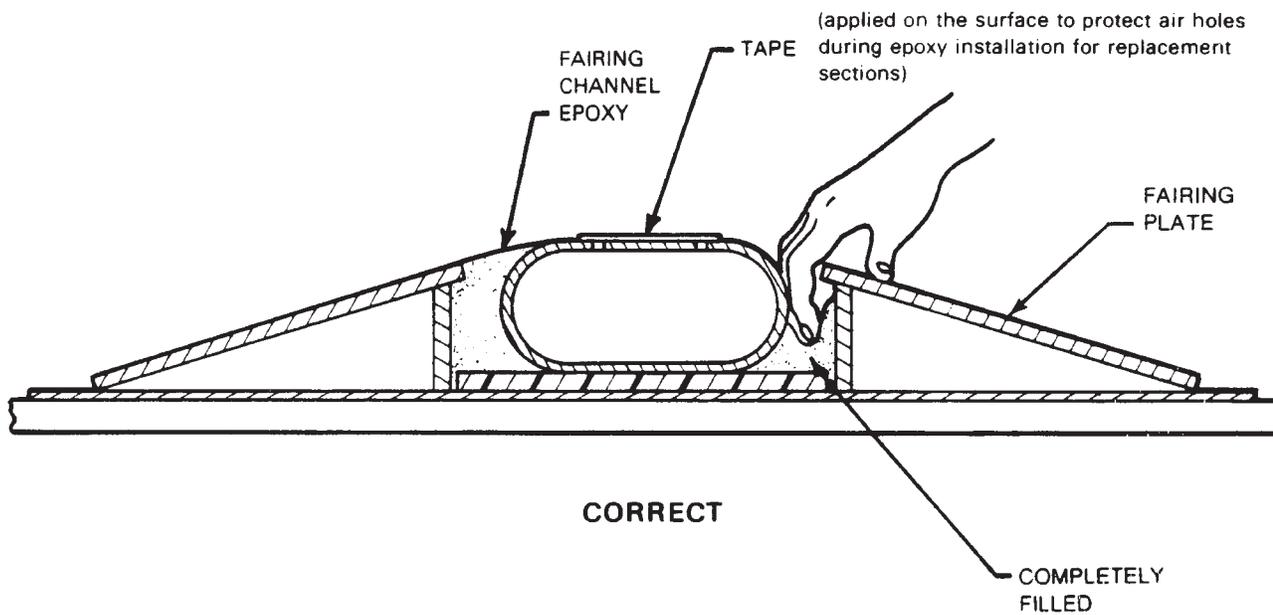
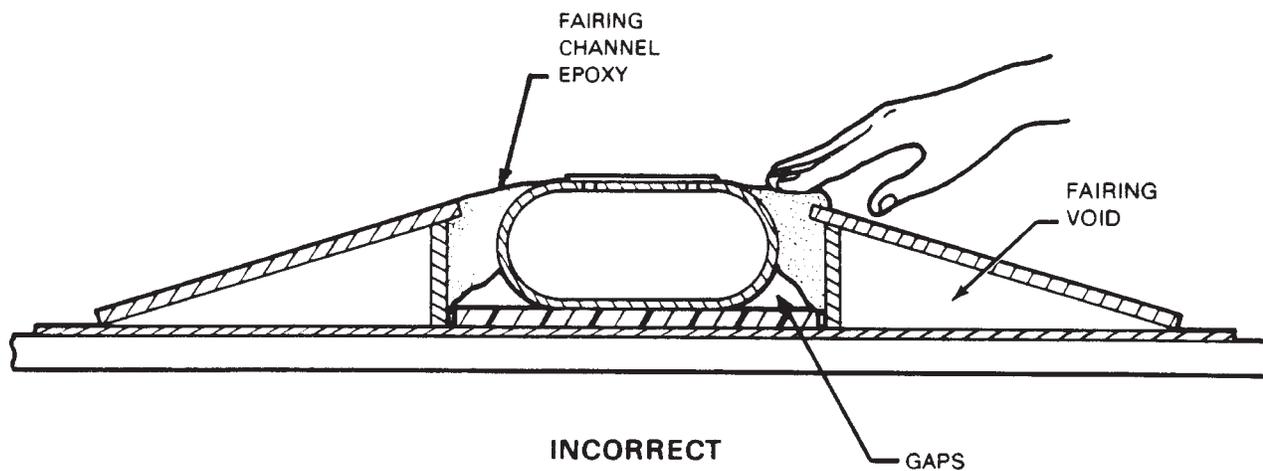


Figure 5-1. Proper Installation of Epoxy in Fairing Channel.

If support straps have been broken off or their insulation is missing, replacement straps are required.

5.4.1 (DV) If the Lexan insulators are missing (figure 5-2), remove the support straps by grinding them off the fairing plates at both ends. If the support straps are missing entirely, proceed with step 5.4.2.

5.4.2 (DV) Grind all rough spots on the fairing plates to a smooth finish. Using a wire brush, thoroughly clean the surfaces on which the new support straps are to be welded.

CAUTION

Wet welding of the fairings will be in accordance with NSTM Chapter 074, with procedural guidelines and information provided by the [Underwater Ship Husbandry Manual \(UWSHM\) welding chapter](#).

5.4.3 (DV) Weld on the new support straps with attached Lexan insulators.

5.4.4 (DV) Apply Hycote to cover all metal areas left bare as a result of grinding and welding.

5.5 REPAIR OF HOLES IN FAIRINGS.

Holes in the fairing plates are most often caused by improper welding of support straps or the breaking off of support straps. In both cases, the holes must be weld repaired and the fairing plate voids must be cleared of all seawater.

5.5.1 (DV) Grind the damaged areas to a smooth finish and thoroughly clean them with a wire brush.

CAUTION

Wet welding of the fairings will be in accordance with NSTM Chapter 074, with all procedural guidelines and

information provided by the [Underwater Ship Husbandry Manual \(UWSHM\) welding chapter](#).

5.5.2 (DV) Weld repair the damaged areas.

5.5.3 (DV) Grind the repaired areas to a smooth finish.

5.5.4 (DV) If required, weld on new support straps as outlined in paragraphs 5.4 through 5.4.4. Apply Hycote to cover all metal areas left bare by grinding and welding.

5.5.5 (DV) Drill a 1/4-inch hole in the appropriate fairing plate at the keel termination. This will be the water exit hole (figure 5-3).

5.5.6 (DV) In the same fairing plate, at the same level of and two inches apart from the water exit hole, drill a small threaded hole to accept an air hose male threaded fitting. This will be the air entry hole (figure 5-3).

NOTE

The water exit and air entry holes should be drilled as close as possible to the keel termination.

5.5.7 (DV) Thoroughly clean the newly drilled holes and surrounding areas with a wire brush.

5.5.8 (DV) Use an air hose equipped with a threaded fitting and ship- or pier-supplied air to pump air through the air entry hole. This air, introduced into the fairing void, will expel water from the void and produce bubbles at the water exit hole once the water has been removed. Ensure that a steady stream of bubbles flows from the water exit hole before proceeding with step 5.5.9.

5.5.9 (DV) Ensure no leaks exist in the fairing void.

5.5.10 (DV) Secure air supply to the fairing void. Plug weld the water exit hole in the fairing plate.

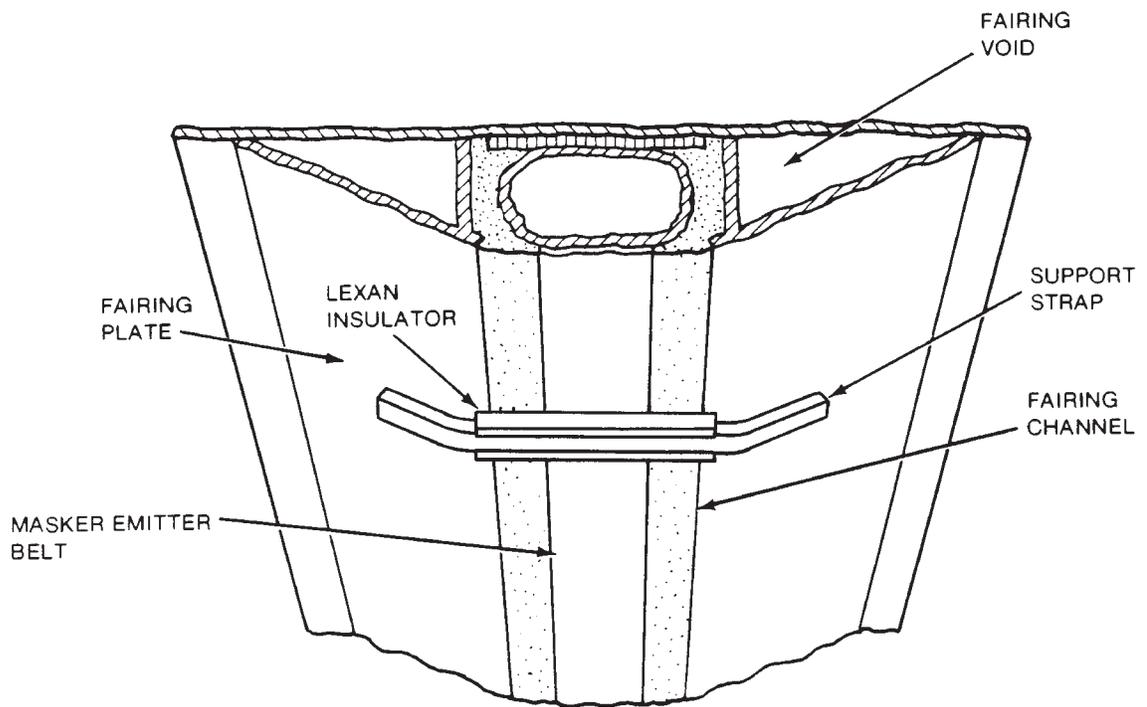


Figure 5-2. Support Strap Replacement.

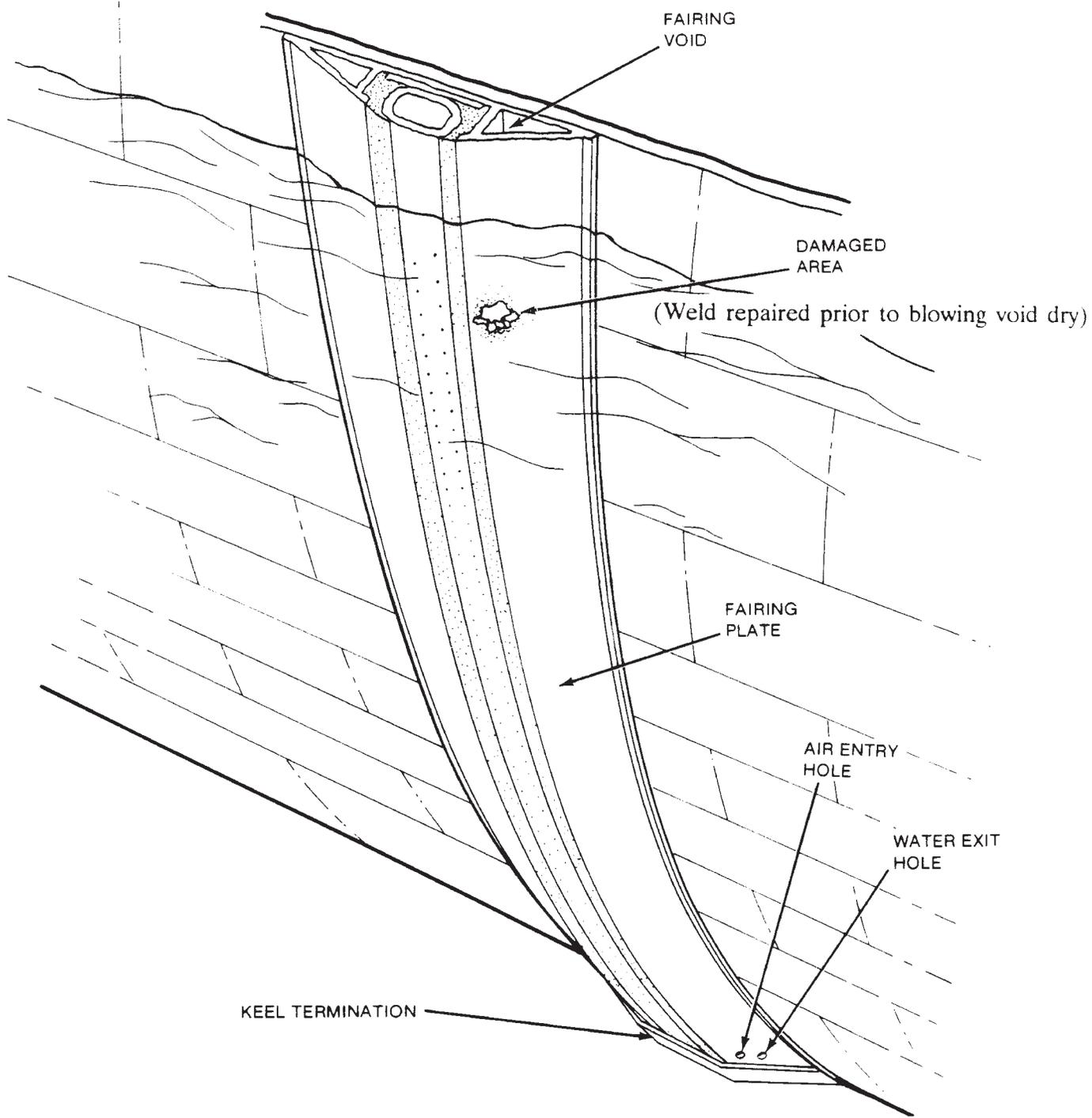


Figure 5-3. Fairing Plate Hole Repair.

5.5.11 (DV) Disconnect air hose and fitting from fairing plate. Plug weld the air entry hole.

5.5.12 (DV) Grind the repaired air entry hole and water exit hole areas to a smooth finish. Apply Hycote to cover all metal areas left bare by welding and grinding.

5.6 REMOVAL AND REPLACEMENT REPAIRS.

If the masker emitter belt is installed forward or aft of the bilge keel, removal and replacement of the entire masker belt from the lowest masker belt guard to the keel termination is required (see the Removal-Replacement Procedure 1, paragraphs 5.7 to 5.7.57). If the masker belt is installed within the span of the bilge keel, removal and replacement is authorized from the lowest masker belt guard to the bilge keel (see [Removal-Replacement Procedure 2, paragraphs 5.8 to 5.8.47](#)) and from the bilge keel to the keel termination (Removal-Replacement Procedure 1).

5.7 REMOVAL - REPLACEMENT PROCEDURE NO. 1.

(DV) Determine the approximate length of replacement masker emitter belt required by measuring from the keel termination to the bilge keel or masker belt guard ([figure 5-4](#)).

5.7.1 (TOP) Assemble a sufficient number of fairing channel template sections, in the order given in [table 2-2](#), to cover the length measured in step 5.7. **DO NOT TIGHTEN THE NUTS ON THE FAIRING CHANNEL TEMPLATE SECTIONS.**

5.7.2 (DV) Place the assembled fairing channel template next to the fairing channel and flat against the hull. Arrange it so that it spans the section to be replaced and conforms to the curvature of the hull.

5.7.3 (DV) Tighten the nuts on the outside of the fairing channel template so the template retains the curvature of the hull.

5.7.4 (DV) Remove the fairing channel template and take it to the surface.

5.7.5 (TOP) Lay out template on pier and trace the inside curvature of the template onto the pier surface. This will be used to verify the proper bending of the replacement section.

NOTE

Topside personnel should make ready the replacement section of masker belt while the divers are removing the damaged section of belt and cleaning the fairing channel. Steps 5.7.6 through 5.7.17 outline the topside replacement belt preparation tasks.

5.7.6 (TOP) Cut a length of new masker emitter belt that is at least 1 foot longer than the measurement provided by the diver in step 5.7.

5.7.7 (TOP) Form an end cap from flat copper-nickel (CuNi) plate and braze it onto the keel end of the replacement masker belt.

5.7.8 (TOP) Use the 2-1/2 inch hole saw ([item 32, table 2-1](#)) to drill a hole 2 inches from the keel end and centered on the replacement section of masker belt ([figure 5-5, section A-A](#)).

5.7.9 (TOP) Braze the 2-1/4 inch diameter by 1/4-inch thick CuNi boss into the 2-1/2 inch diameter hole, flush with the surface of the replacement belt.

5.7.10 (TOP) Use the 1-1/2 inch hole tap to clean the pre-threaded boss.

5.7.11 (TOP) Tighten the 1-1/2 inch cleanout plug into the threaded boss until it is flush with the top surface of the boss.

CAUTION

The replacement section of masker belt must maintain its shape along its entire

length. Use extreme care to ensure that the replacement section does not crimp or flatten during the bending process.

5.7.12 (TOP) Weld target plates to a steel deck or other steel work surface, using the fairing channel template to position the target plates (figure 5-6).

CAUTION

Attempting to bend the masker belt before it is adequately heated can cause crimping or flattening of the belt. Maintain sufficient heat during the entire bending process.

5.7.13 (TOP) Heat the masker belt uniformly along the areas where a smooth curvature needs to be drawn against the target plates to form the desired shape.

5.7.14 (TOP) Form the proper curvature of the heated masker belt by drawing it against the target plates with C-clamps and backing plates (figure 5-7).

5.7.15 (TOP) Allow the masker belt to remain clamped to the target plates until it has completely cooled.

5.7.16 (TOP) Verify that the replacement section is bent to the templated curvature of the hull by comparing the cooled masker belt to the traced curvature on the pier (step 5.7.5).

NOTE

A series of emitter holes must be drilled in the replacement belt. The number of holes per inch to be drilled decreases with distance from the keel end. Hole patterns are determined by the hole pattern information provided on those SHIPALT drawings that are called out in paragraph 2.2.

5.7.17 (TOP) Use a 3/64-inch drill bit to drill emitter holes in the replacement belt in accordance with the applicable ship class SHIPALT drawing. Holes should begin 4-1/2

inches from the keel end of the replacement belt (figure 5-5).

CAUTION

Each side of the fairing channel is a dry, hollow, preserved structure covered by fairing plates. Cutting into the sides of the fairing channel will require repair and represervation. To ensure that the sides of the fairing channel and fairing plate surfaces remain intact, use extreme caution when grinding off support straps and cutting the masker belt.

5.7.18 (DV) Grind off any support straps within the masker belt section to be replaced.

5.7.19 (DV) Cut the existing masker belt just below the bilge keel, or the lowest masker belt guard, if the masker belt is installed forward or aft of the bilge keel as shown in figure 5-4. The belt should be cut in the following sequence:

NOTE

Using multiple cutting wheels to make the cut on the outboard face will result in a wider cut and also eliminate the possibility of the 3-inch wheel binding in the kerf when making the cut on the inboard face.

a. Use two or three 6-inch diameter cutting wheels on a hydraulic peanut grinder to cut in a fore-and-aft line across the outboard face of the masker belt. Be careful not to cut into the fairing channel sides.

b. Once the outboard face has been cut, use a single 3-inch diameter cutting wheel on the peanut grinder to cut in a fore-and-aft line across the inboard face of the masker belt. Be careful not to cut into the sides of the fairing channel.

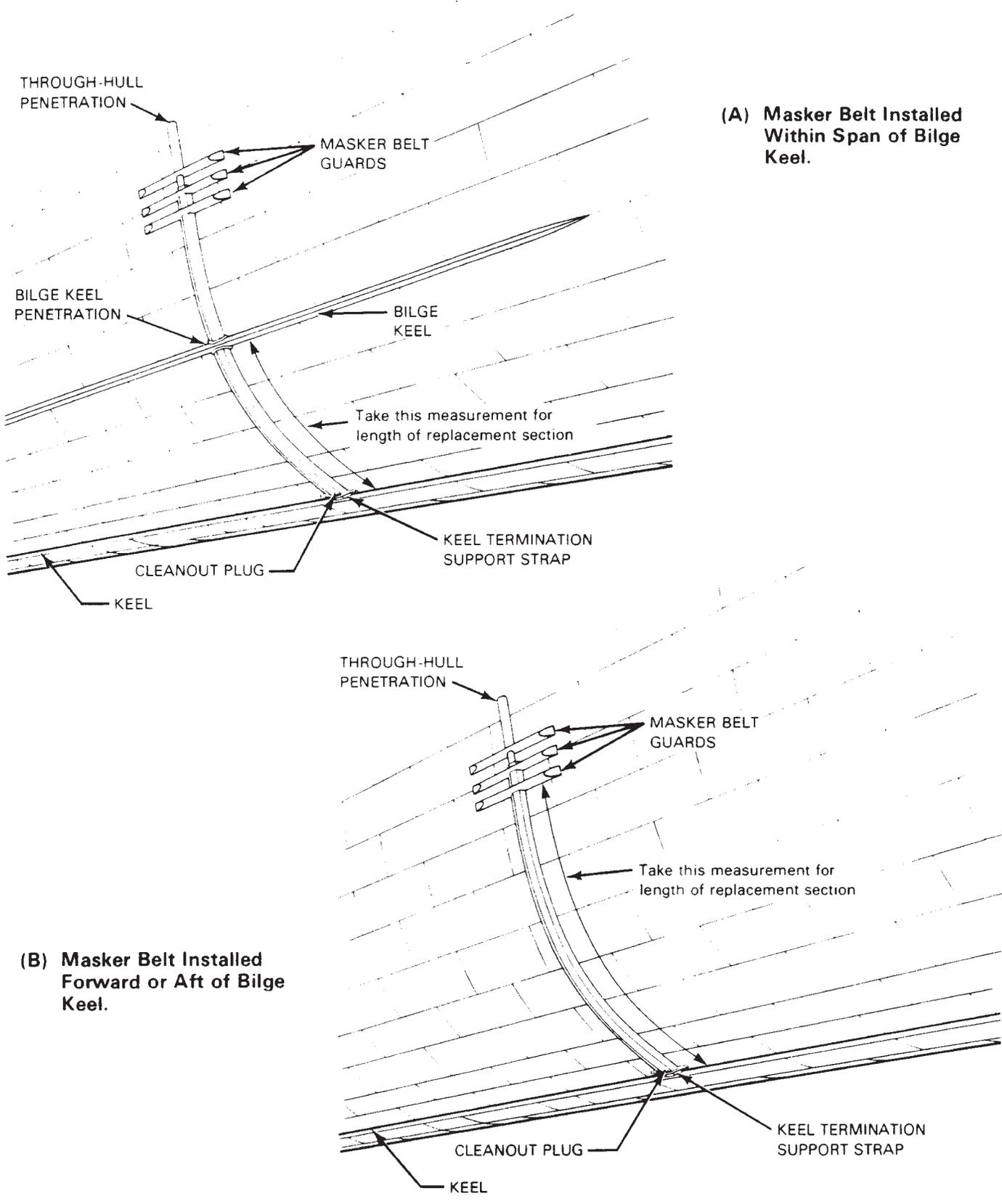


Figure 5-4. Measurement to Determine Length of Replacement Masker Belt, Procedure 1.

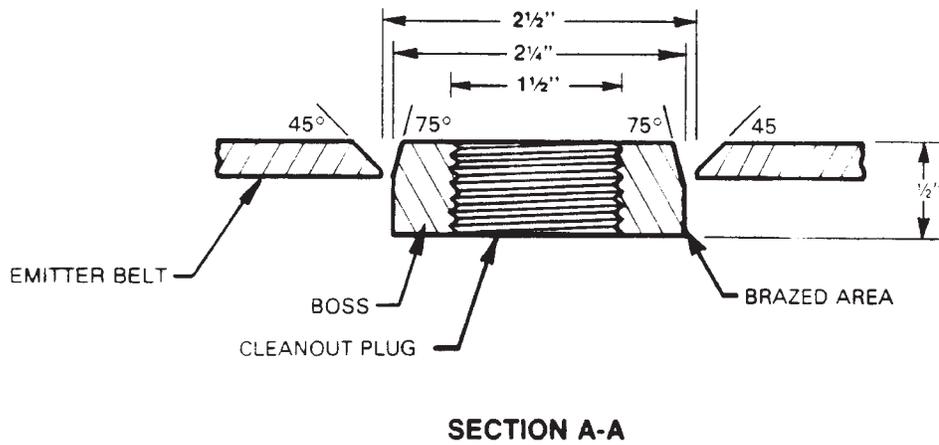
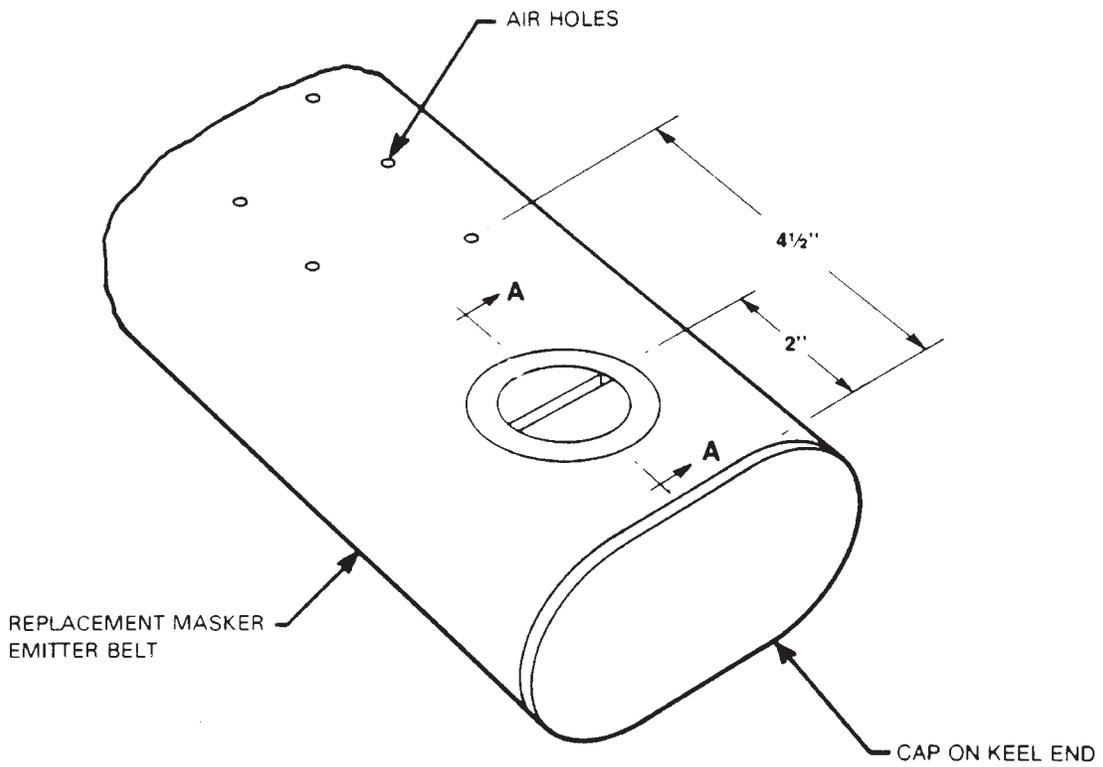


Figure 5-5. Keel End of Replacement Section of Masker Belt.

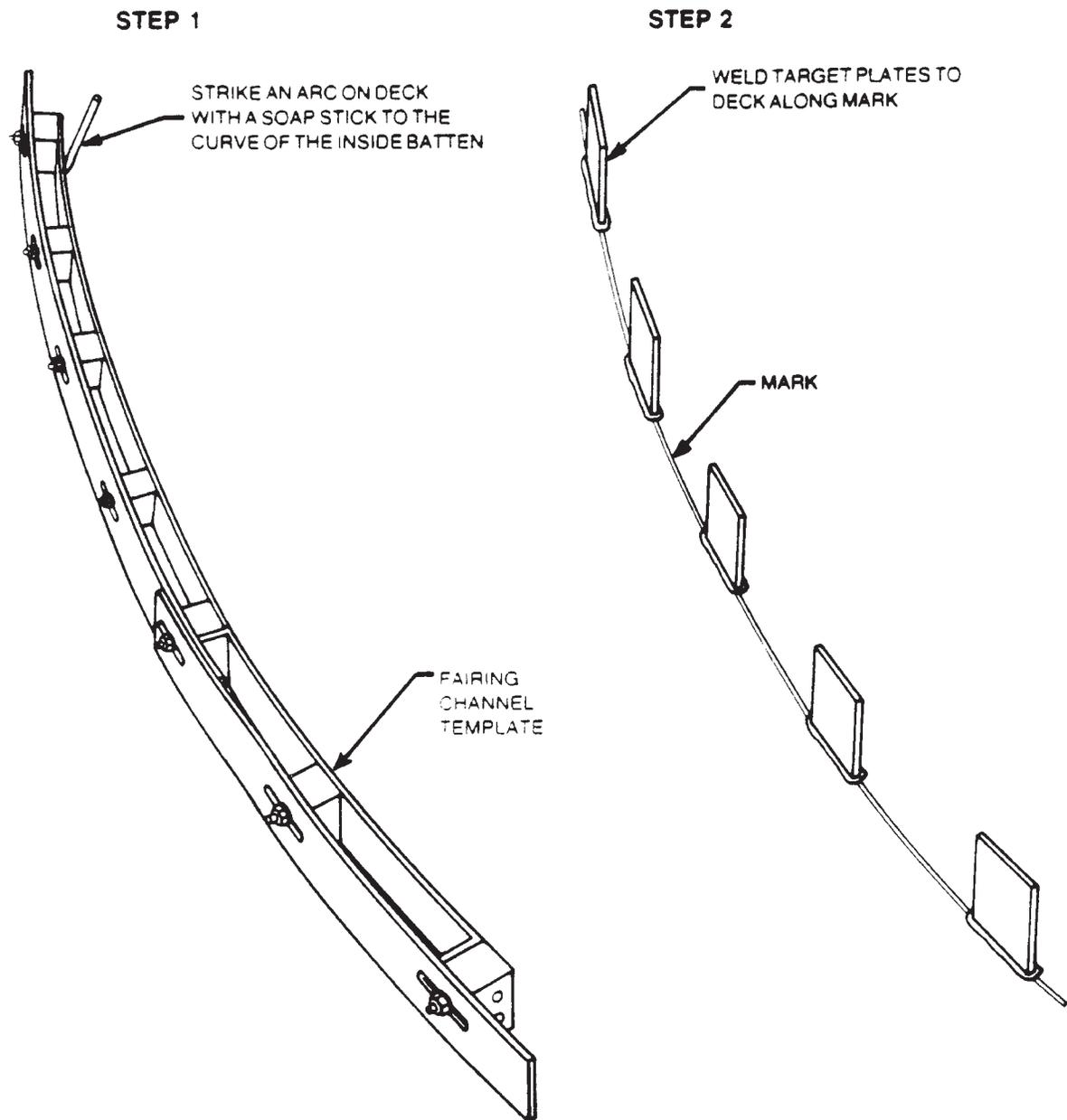


Figure 5-6. Locating Target Plates with the Fairing Channel Template.

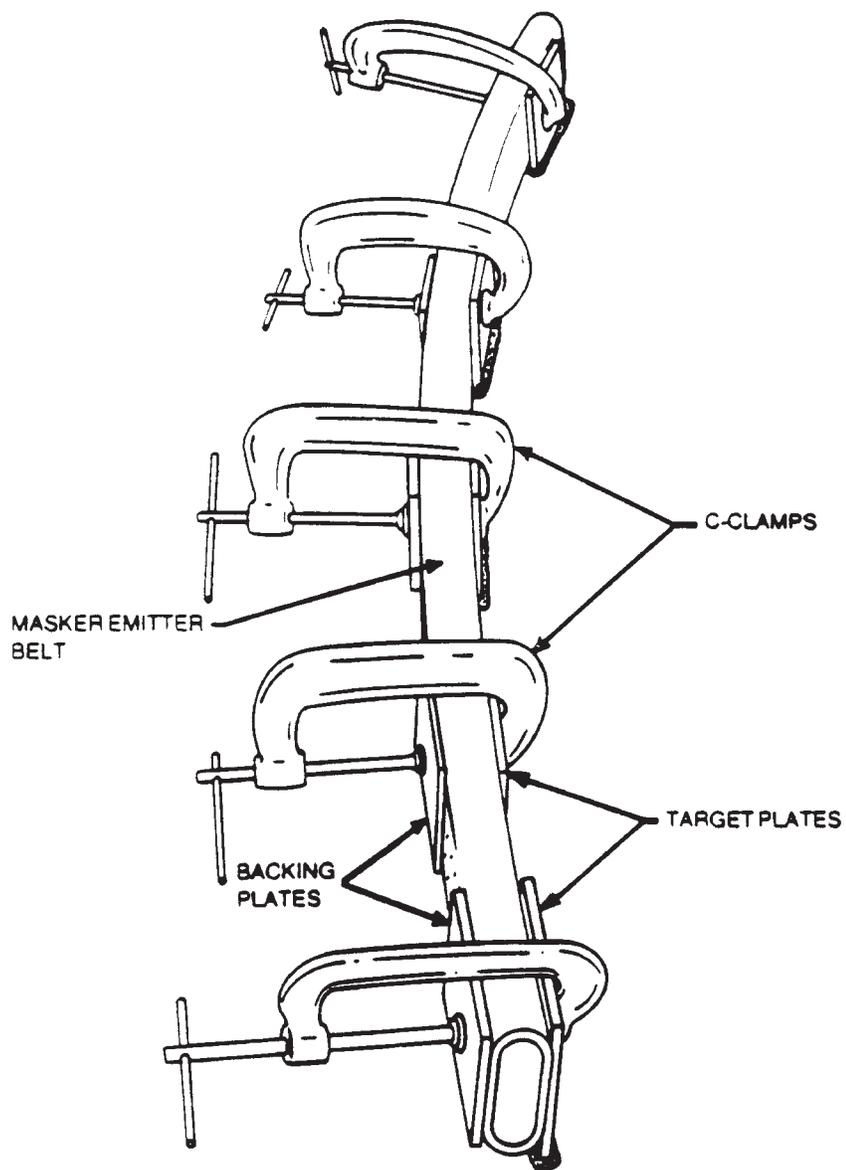


Figure 5-7. Forming Replacement Belt to the Target Plates.

NOTE

If the cut cannot be completed by the cutting wheels without cutting into the sides of the fairing channel, cut as far as possible with the wheels; then finish cutting the sides of the masker belt with a thin, sharp cold chisel. The Lexan strip between the masker belt and the hull should prevent any cutting of the hull plating.

5.7.20 (DV) Remove the damaged section of masker belt and transfer it to the surface for disposal.

CAUTION

Hydroblasting with high pressure water jet equipment will remove paint. Ensure that the water jet is directed only on the surface of the masker belt, the epoxy to be removed, and the interior surfaces of the fairing channel and not on painted surfaces. The Lexan insulator strip behind the masker belt can be damaged if the water jet is aimed directly at it for extended periods.

NOTE

The empty portion of the fairing channel must be thoroughly cleaned and free of old epoxy before installing the replacement section of masker emitter belt. Any old epoxy that cannot be removed by hydroblasting must be removed by hydraulic peanut grinder, hydraulic chipping hammer, or handheld chisel as appropriate.

5.7.21 (DV) Hydroblast the interior of the empty fairing channel from the cut made in step 5.7.19 to the keel termination support strap. Try not to damage the Lexan insulator strip installed in the fairing channel.

5.7.22 (DV) Measure the exact distance from the outboard edge of the keel termination support strap to the cut at the end of the existing masker belt ([figure 5-5](#)) and report the

measurement to topside personnel.

5.7.23 (TOP) Subtract 1/4 inch from the measurement provided by the diver in [step 5.7.22](#), and cut the replacement section of masker belt to this length.

NOTE

While final fabrication of the replacement section of masker belt is being accomplished, divers should be installing repair clamps in accordance with the procedures beginning at step 5.7.27.

5.7.24 (DV) Fit check the 7-1/2-inch CuNi insert which goes into the end of the masker belt left in place. This is done prior to brazing the insert into the replacement belt section.

5.7.25 (TOP) Place a 7.5-inch CuNi insert into the outboard (upper) end of the replacement section of masker belt so that 4.5 inches of the insert protrude from the end of the belt.

5.7.26 (TOP) Braze all the way around the seam formed by the insert and the replacement section.

5.7.27 Use the following procedure to install repair clamps over the fairing plates.

CAUTION

Wet welding of repair clamp padeyes to the fairing plates will be in accordance with NSTM Chapter 074, with procedural guidelines and information provided by the [UWSHM welding chapter](#). All padeyes shall be welded on one side only, to allow for easy removal.

5.7.28 (DV) Install the first of the repair clamps 6 inches below the cut of the existing masker belt. Weld a padeye to the fairing plate on one side of the fairing channel as shown in [figure 5-8\(A\)](#).

5.7.29 (DV) Pin one end of a repair clamp onto the attached padeye, then pin another padeye onto the opposite end of the repair clamp. Position the second padeye as shown in

figure 5-8(B).

5.7.30 (DV) Weld the second padeye in position.

5.7.31 (DV) Repeat steps 5.7.28 through 5.7.30 until all required repair clamps are installed in the following pattern:

- a. One repair clamp 6 inches below the cut end of the existing masker belt;
- b. One repair clamp 6 inches from the keel termination support strap;
- c. One repair clamp approximately every 4 feet between the two end clamps.

5.7.32 (DV) Replace any damaged or missing Lexan backing material in the fairing channel.

NOTE

A small amount of epoxy applied to two or three locations on the replacement Lexan insulator strip will hold the Lexan in place while the masker belt is being fitted.

5.7.33 (DV) Using a sledge hammer and wedge, spread the open end of the existing masker belt to ensure proper fit of the replacement section brazed insert.

5.7.34 (DV) Drill two 1/4-inch fill and vent holes in the end of the existing masker belt for injection of HP-2 Elastolock to seal the repair insert of the replacement belt section (figure 5-9). The first hole, to be drilled 2-1/2 inches up the existing belt, will serve as the epoxy fill hole. The second hole, to be drilled 2 inches up the existing belt, will be the epoxy vent, or exit, hole.

5.7.35 (TOP) Cover the outboard, drilled side of the replacement section of masker belt with tape to prevent epoxy from clogging the air holes.

5.7.36 (TOP) Attach a handling line to the replacement section of masker belt and lower section into water, keel end first.

5.7.37 (DV) Guide the replacement section of masker belt through the repair clamps (figure 5-9), as topside personnel lower it. Allow it to rest on the repair clamp support pads, with the keel end of the replacement section resting outside the keel termination support strap (figure 5-10).

5.7.38 (TOP) Support the replacement section of masker belt with the attached handling line.

5.7.39 (DV) Fit the brazed insert of the replacement section into the open end of the existing masker belt far enough to allow the keel end of the replacement section to move past the keel termination support strap and into the fairing channel.

5.7.40 (DV) Adjust all the repair clamps (figure 5-9) as necessary to support the replacement section of masker belt.

5.7.41 (DV) Move the replacement section of masker belt toward the keel until the keel end of the replacement section of masker belt is at least 1/2 inch below the outboard (upper) edge of the keel termination support strap (figure 5-10, section A-A).

5.7.42 (DV) Tighten all repair clamps to hold the replacement section of masker belt securely in place.

CAUTION

The electrical isolation of the belt may be lost if the gap between the keel termination support strap and the masker emitter belt has not been adequately filled with epoxy. There must be at least 1/4 inch of epoxy between the belt and the support strap.

5.7.43 (DV) Verify that the cleanout plug on the keel end of the replacement section is not covered by the keel termination support gap between the keel termination support strap and the masker belt. Verify the fit of the replacement masker belt to the contour of the fairing channel. Figure 5-11 shows the proper replacement section fit-up configuration.

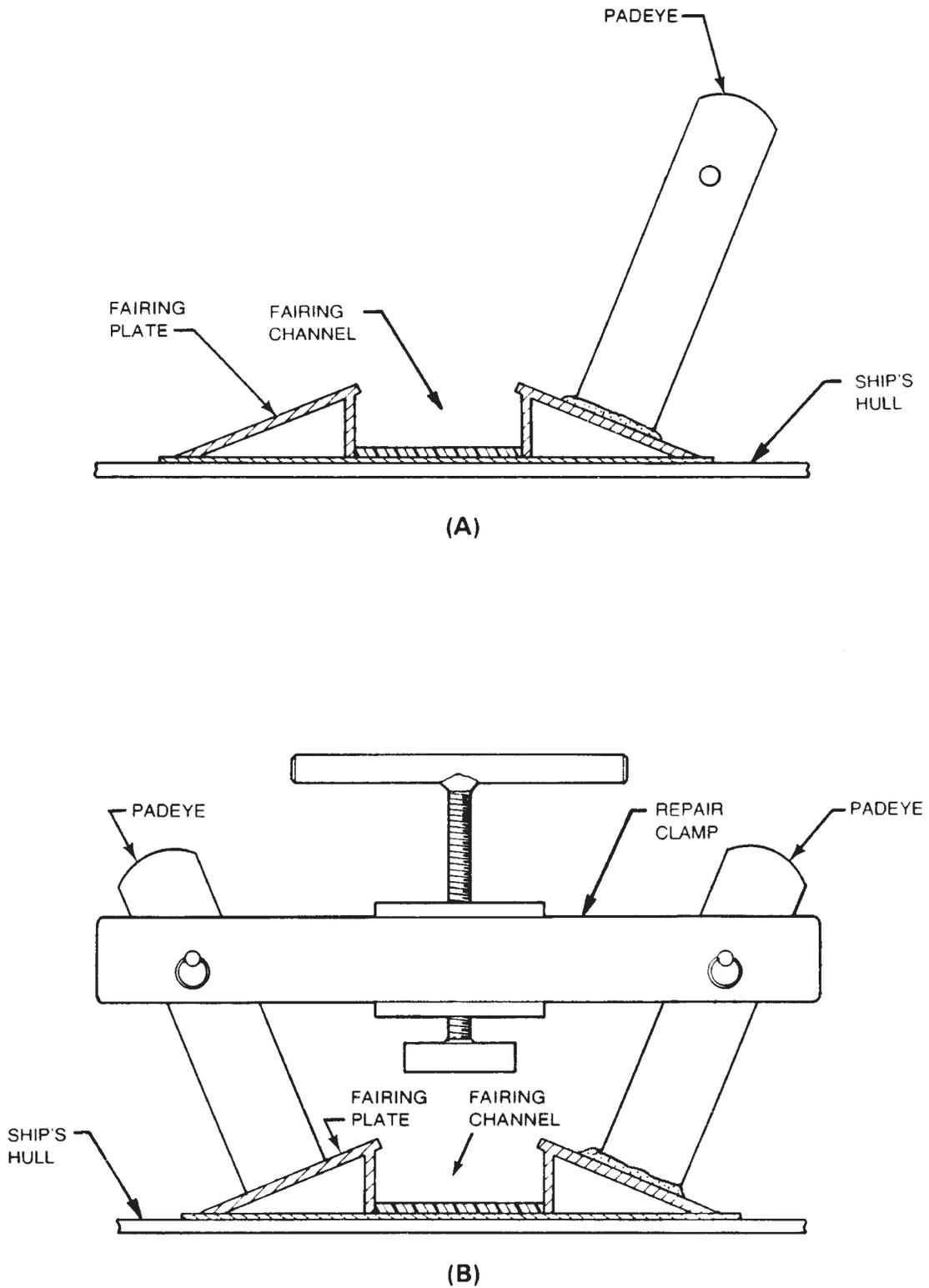


Figure 5-8. Installation of First Padeye and Repair Clamp Over the Fairing Channel.

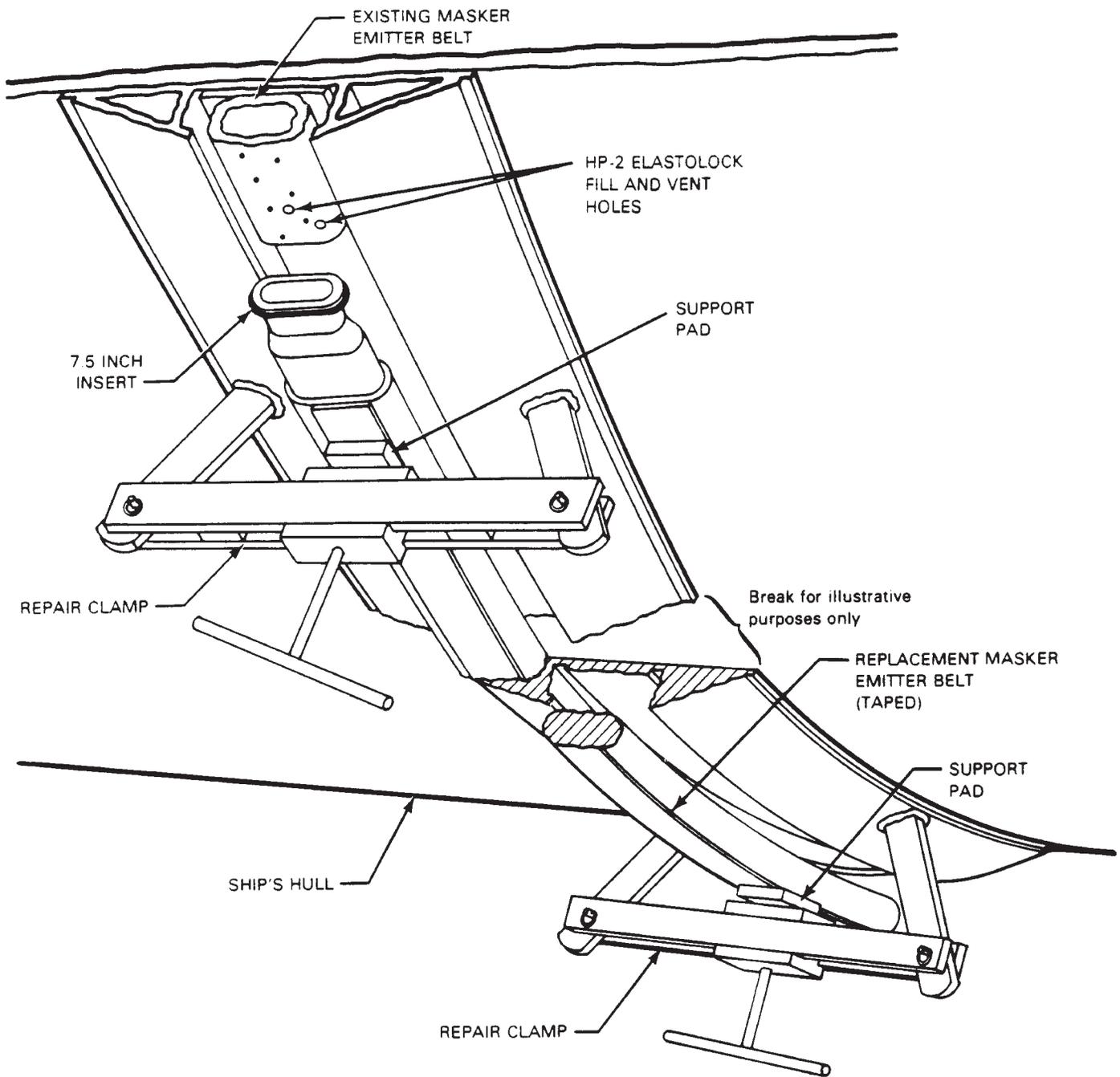


Figure 5-9. Replacement Section of Masker Belt Resting on Repair Clamp Support Pads, Procedure 1.

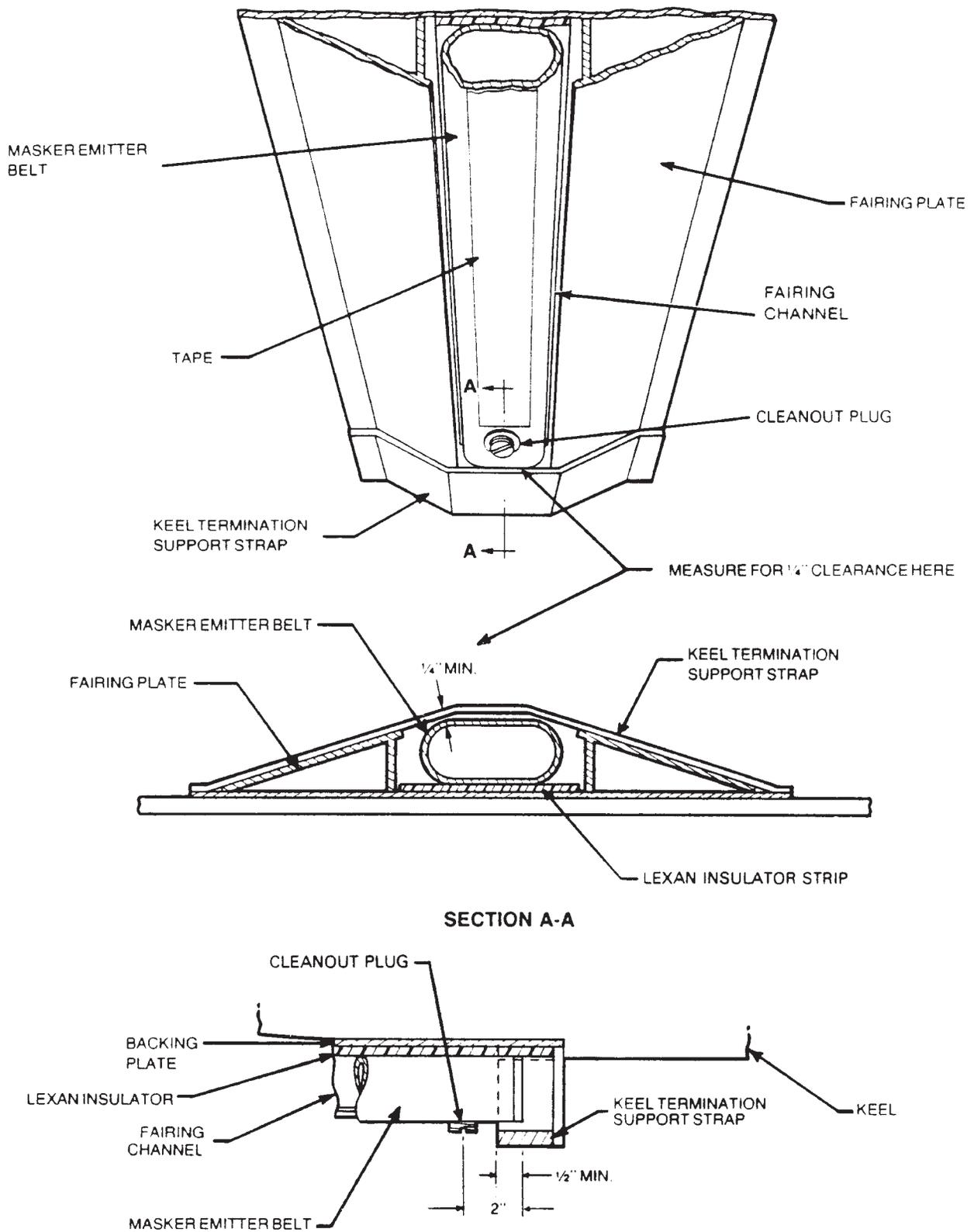


Figure 5-10. Replacement Section of Masker Belt Fit-up Configuration, Procedure 1.

5.7.44 (DV) Using the Semco sealant gun, inject the HP-2 Elastolock into the fill hole in the existing belt until it overflows from the vent hole. This provides a positive air seal at the union of the existing belt and the replacement section.

5.7.45 (TOP/DV) Mix and install epoxy as indicated in [steps 5.3.2 through 5.3.9](#).

CAUTION

The electrical isolation of the belt may be lost if the gap between the keel termination support strap and the masker emitter belt has not been adequately filled with epoxy. There must be at least 1/4 inch of epoxy between the belt and the support strap.

5.7.46 (DV) Verify that at least 1/4 inch of epoxy is in place between the masker belt and the keel termination support strap.

5.7.47 (DV) Fair the epoxy to the outer surface of the masker belt and to the edges of the fairing channel along the entire length of the replacement section of masker belt. Ensure that the epoxy has not covered the cleanout plug at the keel end of the replacement section.

5.7.48 (TOP/DV) Allow the epoxy to cure for 24 hours before continuing with these procedures.

5.7.49 (TOP) Prepare the support straps for installation by bending them to conform to the fairing plates. Paint the straps and attach Lexan insulator with black electrical tape.

CAUTION

Wet welding of support straps to the fairings will be in accordance with NSTM Chapter 074, with procedural guidelines and the information that is provided in [UWSHM welding chapter](#).

5.7.50 (DV) Place a support strap with Lexan insulator strip across the masker emitter belt above each repair clamp location and weld the ends of the support straps to the fairing plates as shown in [figure 5-11](#).

5.7.51 (DV) Remove all repair clamps and take them to the surface.

5.7.52 (DV) Remove the repair clamp padeyes from the fairing plates by grinding away the welds.

CAUTION

Do not penetrate the wall of the fairing plates.

5.7.53 (DV) Grind the fairing plates smooth in the areas where the padeyes were welded, to eliminate rough spots, sharp transitions, or pits.

5.7.54 (DV) Apply Hycote to cover all metal areas left bare by grinding and by welding support straps in place. After the Hycote has cured, remove the tape from the replacement section of masker belt.

5.7.55 (TOP/DV) Apply air to the belt and verify that the existing belt/replacement section union is not leaking and that air is flowing through the entire belt.

5.7.56 (TOP) Prepare a final report documenting the accomplished repair. Documentation should consist of Inspection Reports, Data Sheets, 35 mm still photographs, and video logs. Send copy of final report to NAVSEA 00C5.

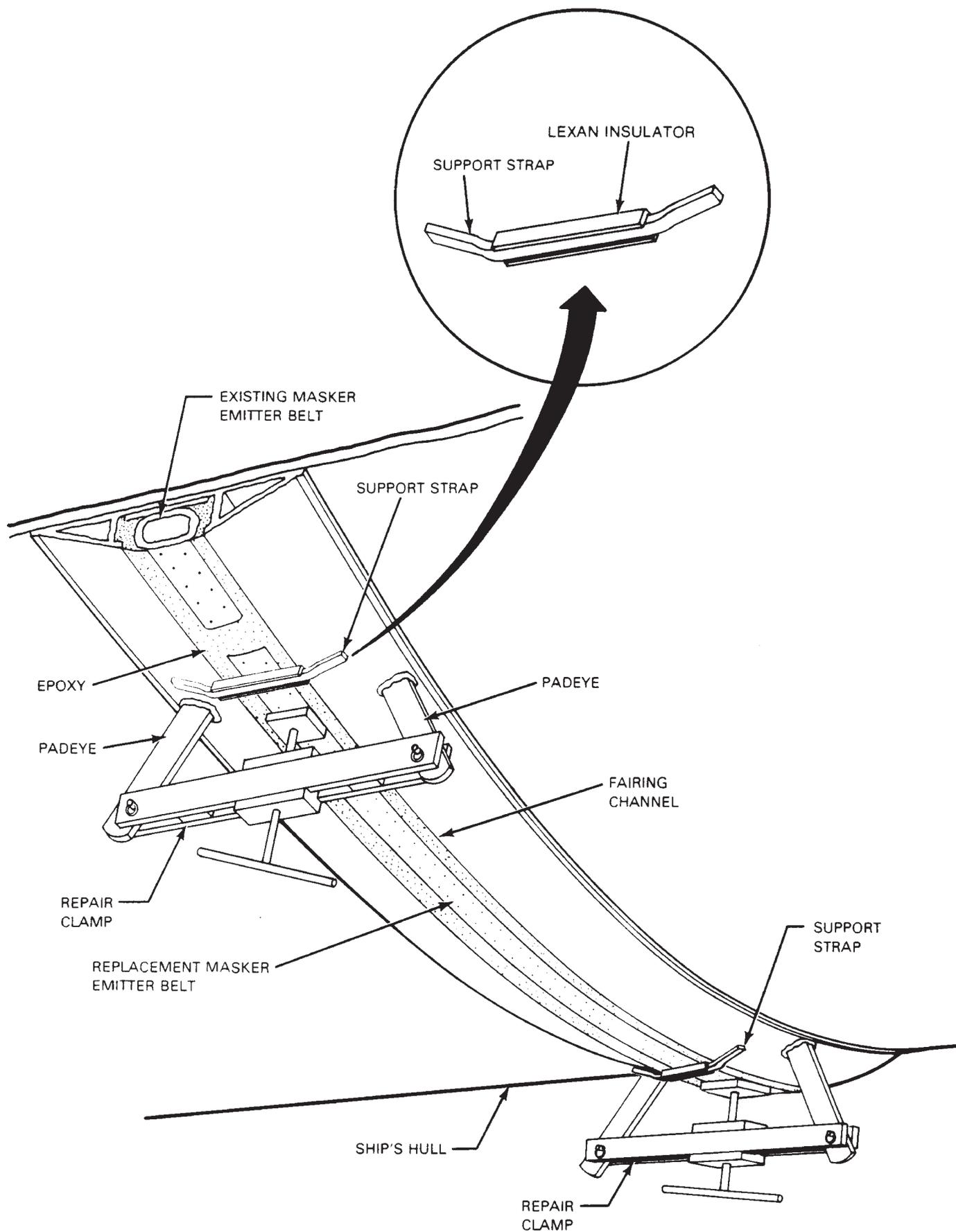


Figure 5-11. Repair Clamps Holding Support Straps in Place.

5.7.57 (TOP) The final report shall include the quantities of all expendable material used to complete the job, details regarding any problems encountered, new or special tools needed, and modifications to tools or procedures.

5.8 REMOVAL-REPLACEMENT PROCEDURE NO. 2.

Many of the steps in this procedure are the same as steps in Removal-Replacement Procedure 1. To avoid the need to refer back and forth between pages of this manual when following these instructions, procedure 2 is presented fully, duplicating procedure 1 where necessary.

5.8.1 (DV) Determine the approximate length of replacement masker belt required by measuring the distance from lowest masker belt guard to the keel ([figure 5-12](#)).

5.8.2 (TOP) Assemble a sufficient number of fairing channel template sections, in the order given in [table 2-2](#), to span the distance measured in step 5.8.1. **DO NOT TIGHTEN THE NUTS ON THE FAIRING CHANNEL TEMPLATE SECTIONS.**

5.8.3 (DV) Place the assembled fairing channel template next to the fairing channel and against the hull. Arrange the fairing channel template to conform to the curvature of the hull between the lowest masker belt guard and the bilge keel.

5.8.4 (DV) Tighten the nuts on the outside of the fairing channel template so the template retains the curvature of the hull.

5.8.5 (DV) Remove the fairing channel template and take it to the surface.

5.8.6 (TOP) Lay out template on pier and trace the inside curvature of the template onto the pier surface. This will be used to verify proper bending of the replacement section.

NOTE

Topside personnel should prepare the replacement section of masker belt while divers are removing the damaged section of masker belt and cleaning the fairing channel. Topside replacement belt preparation is covered in steps 5.8.7 through 5.8.13.

5.8.7 (TOP) Cut a length of new masker belt that is at least 1 foot longer than the measurement by the diver in step 5.8.1.

5.8.8 (TOP) Weld target plates to a steel deck or other steel work surface, using the fairing channel template to position the target plates ([figure 5-6](#)).

CAUTION

The replacement section of masker belt must maintain its shape along its entire length. Use extreme care to ensure that the replacement section does not crimp or flatten during the bending process.

Attempting to bend the masker belt before it is adequately heated can cause crimping or flattening of the belt. Maintain sufficient heat throughout the bending process.

5.8.9 (TOP) Heat the masker belt uniformly along the areas where a smooth curvature needs to be drawn against the target plates to form the desired shape.

5.8.10 (TOP) Form the proper curvature of the heated masker belt by drawing it against the target plates with C-clamps and backing plates ([figure 5-7](#)).

5.8.11 (TOP) Allow the masker belt to remain clamped to the target plates until it has completely cooled.

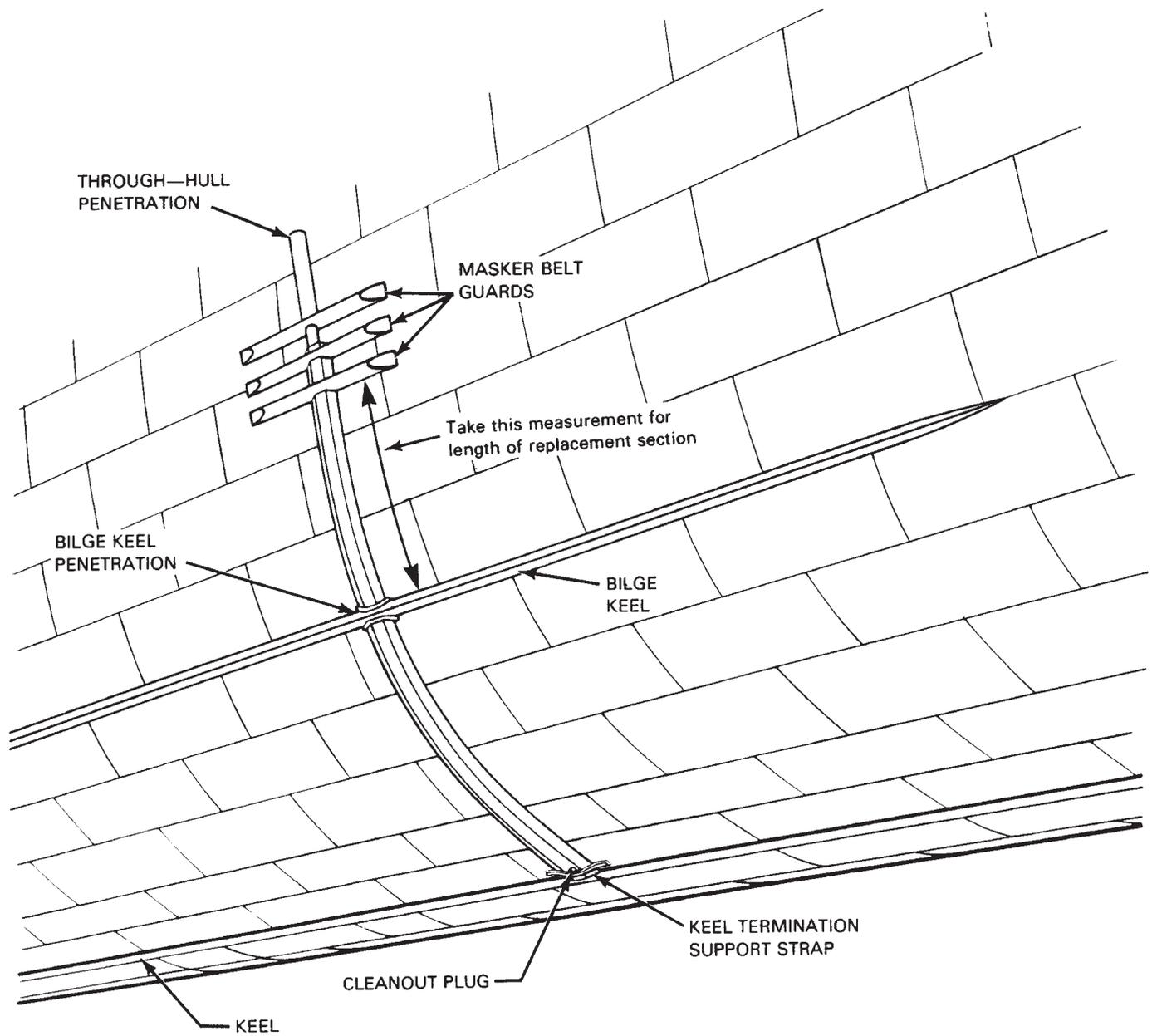


Figure 5-12. Measurement to Determine the Length of Replacement Belt, Procedure 2.

5.8.12 (TOP) Verify that the replacement belt has been bent to the templated curvature of the hull by comparing the cooled masker belt to the traced curvature on the pier ([step 5.8.6](#)).

NOTE

A series of emitter holes must be drilled in the replacement belt. The number of holes per inch to be drilled decreases with distance from the keel end. Hole patterns are determined by the hole pattern information provided on the SHIPALT drawings called out in [paragraph 2.2](#).

5.8.13 (TOP) Use a 3/64-inch drill bit to drill emitter holes in the replacement belt in accordance with the applicable ship class SHIPALT drawing ([see paragraph 2.2](#)).

CAUTION

Each side of the fairing channel is a dry, hollow, preserved structure covered by fairing plates. Cutting into the sides of the fairing channel will require repair and represervation. To ensure that the sides of the fairing channel and the fairing plate surfaces remain intact, use extreme caution when grinding off support straps and cutting the masker belt.

5.8.14 (DV) Grind off any support straps within the masker belt section to be replaced.

5.8.15 (DV) Cut the existing masker belt just below the lowest masker belt guard and just above the bilge keel. The belt should be cut in the following sequence:

NOTE

Using multiple cutting wheels to make the cut on the outboard face will produce a wider cut and eliminate the possibility of the 3-inch wheel binding in the kerf when making the cut on the inboard face.

a. Use two or three 6-inch diameter cutting wheels on a hydraulic peanut grinder to

cut in a fore-and-aft line across the outboard face of the masker belt, being careful not to cut into the sides of the fairing channel.

b. Once the outboard face has been cut, use a single, 3-inch diameter cutting wheel on the peanut grinder to cut in a fore-and-aft line across the inboard face of the masker belt. Be careful not to cut into the sides of the fairing channel.

NOTE

If the cut cannot be completed by the cutting wheels without cutting into the sides of the fairing channel, cut as far as possible with the wheels, then finish cutting the sides of the masker belt with a thin, sharp, cold chisel. The Lexan strip between the masker belt and the hull should prevent any cutting of the hull plating.

5.8.16 (DV) Remove the damaged section of masker belt and transfer it to the surface for disposal.

CAUTION

Hydroblasting with high pressure water jet equipment will remove paint. Ensure that the water jet is directed only on the surface of the masker belt, the epoxy to be removed, and the interior surfaces of the fairing channel and not on painted surfaces. The Lexan insulator strip behind the masker belt can be damaged if the water jet is aimed directly at it for extended periods.

NOTE

The empty portion of the fairing channel must be thoroughly cleaned and free of all old epoxy before installing the replacement section of masker belt. Any old epoxy that cannot be removed by hydroblasting must be removed by hydraulic peanut grinder, hydraulic chipping hammer, or hand-held chisel as appropriate.

5.8.17 (DV) Hydroblast the interior of the empty fairing channel between the cuts made in [step 5.8.15](#). Try not to damage the Lexan strip installed in the fairing channel.

5.8.18 (DV) Measure the exact distance between the cuts made on the existing masker belt ([figure 5-12](#)) and report the measurement to topside personnel.

5.8.19 (TOP) Subtract 5-1/4 inches from the measurement that was provided by the diver in step 5.8.18, and cut the replacement section of masker belt to this length.

NOTE

While the final fabrication of the replacement section of masker belt is being accomplished, divers should be installing repair clamps in accordance with the procedures beginning at step 5.8.23.

5.8.20 (DV) Fit check a 7-1/2-inch CuNi insert in the existing masker belt cut just above the bilge keel. Fit check a 13-1/2-inch CuNi insert in the existing masker belt cut just below the lowest masker belt guard.

5.8.21 (TOP) Place a 7-1/2-inch CuNi insert into the inboard (lower) end of the replacement section of masker belt so that exactly 5 inches protrude from the replacement section. Place a 13.5-inch CuNi insert into the outboard (upper) end of the masker belt section so that at least 9.5 inches protrude from the masker belt section.

5.8.22 (TOP) Braze all the way around the seams formed by the inserts and the replacement section.

5.8.23 Use the following procedures to install the repair clamps over the fairing channel.

CAUTION

Wet welding of repair clamp padeyes to the fairing channel will be in accordance with NSTM Chapter 074, with procedural guidelines and information provided by

the [UWSHM welding chapter](#). All padeyes shall be welded on one side only, to allow for easy removal.

5.8.24 (DV) Install the first repair clamp 6 inches below the top cut in the existing masker belt. Weld a padeye to the fairing plate on one side of the fairing channel as shown in [figure 5-8\(A\)](#).

5.8.25 (DV) Pin one end of a repair clamp onto the attached padeye, then pin another padeye onto the opposite end of the repair clamp. Position the second padeye on the opposite end of the repair clamp as shown in [figure 5-8\(B\)](#).

5.8.26 (DV) Weld the second padeye in position.

5.8.27 (DV) Repeat steps 5.8.24 through 5.8.26 until all required repair clamps are installed in the following pattern:

- a. One repair clamp 6 inches below the top cut in the existing masker belt;
- b. One repair clamp 6 inches above the bottom cut in the existing masker belt;
- c. One repair clamp approximately every 4 feet between the two end clamps.

5.8.28 (DV) Replace any damaged or missing Lexan backing material in the fairing channel.

NOTE

A small amount of epoxy applied to two or three places on the Lexan insulator strip will hold the Lexan in place while the masker belt is being fitted.

5.8.29 (DV) Using a sledge hammer and wedge, spread both open ends of the existing masker belt to ensure proper fit of the replacement section brazed inserts.

5.8.30 (DV) Drill two 1/4-inch fill and vent holes in each open end of the existing masker belt for injection of HP-2 Elastolock to seal the

repair inserts attached to the replacement belt section ([figure 5-13](#)). The first holes are drilled 2-1/2 inches up each of the existing sections of masker belt and will serve as epoxy fill holes for those belt sections. The second holes, to be drilled 2 inches up each of the masker belt sections, serve as the epoxy vent, or exit, holes.

5.8.31 (TOP) Cover the outboard, drilled side of the replacement masker belt with tape to prevent epoxy from clogging the air holes.

5.8.32 (TOP) Attach a handling line to the replacement section of masker belt and lower section into water, keel end first.

5.8.33 (DV) Guide the replacement masker belt through the repair clamps as topside personnel lower it. Allow it to rest on repair clamp support pads ([figure 5-13](#)).

5.8.34 (TOP) Support the replacement section of the masker belt with the attached handling line.

5.8.35 (DV) Fit the brazed inserts of the replacement section into the open ends of the existing masker belt by first working the outboard (upper) insert into the outboard section of existing masker belt far enough to allow the inboard (lower) insert to clear the inboard section of the existing masker belt.

5.8.36 (DV) Slide the replacement section of masker belt toward the keel, guiding the inboard (lower) insert into the inboard section of the existing masker belt until it is seated as far as it will go.

5.8.37 (DV) Tighten all repair clamps to hold the replacement section of masker belt securely in place.

5.8.38 (DV) Verify the fit of the replacement section of masker belt to the contour of the fairing channel.

5.8.39 (DV) Using the Semco sealant gun, inject the HP-2 Elastolock into the fill holes in the existing belt until it overflows from the vent holes. This provides a positive air seal at the

unions of the existing belt and the replacement section. Ensure that both upper and lower unions are sealed.

5.8.40 (TOP/DV) Mix and install epoxy as indicated in [steps 5.3.2 through 5.3.9](#).

5.8.41 (DV) Fair the epoxy to the outer surface of the masker belt and to the edges of the fairing channel along the entire length of the replacement section of masker belt.

5.8.42 (TOP/DV) Allow the epoxy to cure for 24 hours before continuing.

CAUTION

Wet welding of support straps to the fairings will be in accordance with the NSTM Chapter 074, with the procedural guidelines and information that is provided in the [UWSHM welding chapter](#).

5.8.43 (DV) Place a support strap with Lexan insulator strip across the masker emitter belt above each repair clamp location and weld the ends of the support straps to the fairing plates as shown in [figure 5-11](#).

5.8.44 (DV) Remove all repair clamps. Take them to the surface. Remove repair clamp padeyes by grinding away welds.

CAUTION

Do not penetrate the wall of the fairing plates.

5.8.45 (DV) Grind the fairing plates smooth in the areas where the padeyes were welded, to eliminate rough spots, sharp transitions, or pits.

5.8.46 (DV) Apply Hycote to cover all metal areas left bare by grinding and by welding the support straps in place. After the Hycote has cured, remove the tape from the replacement section of masker belt.

5.8.47 (TOP/DV) Apply air to the belt and verify that the existing belt/replacement section union is not leaking and that air is flowing through the entire belt.

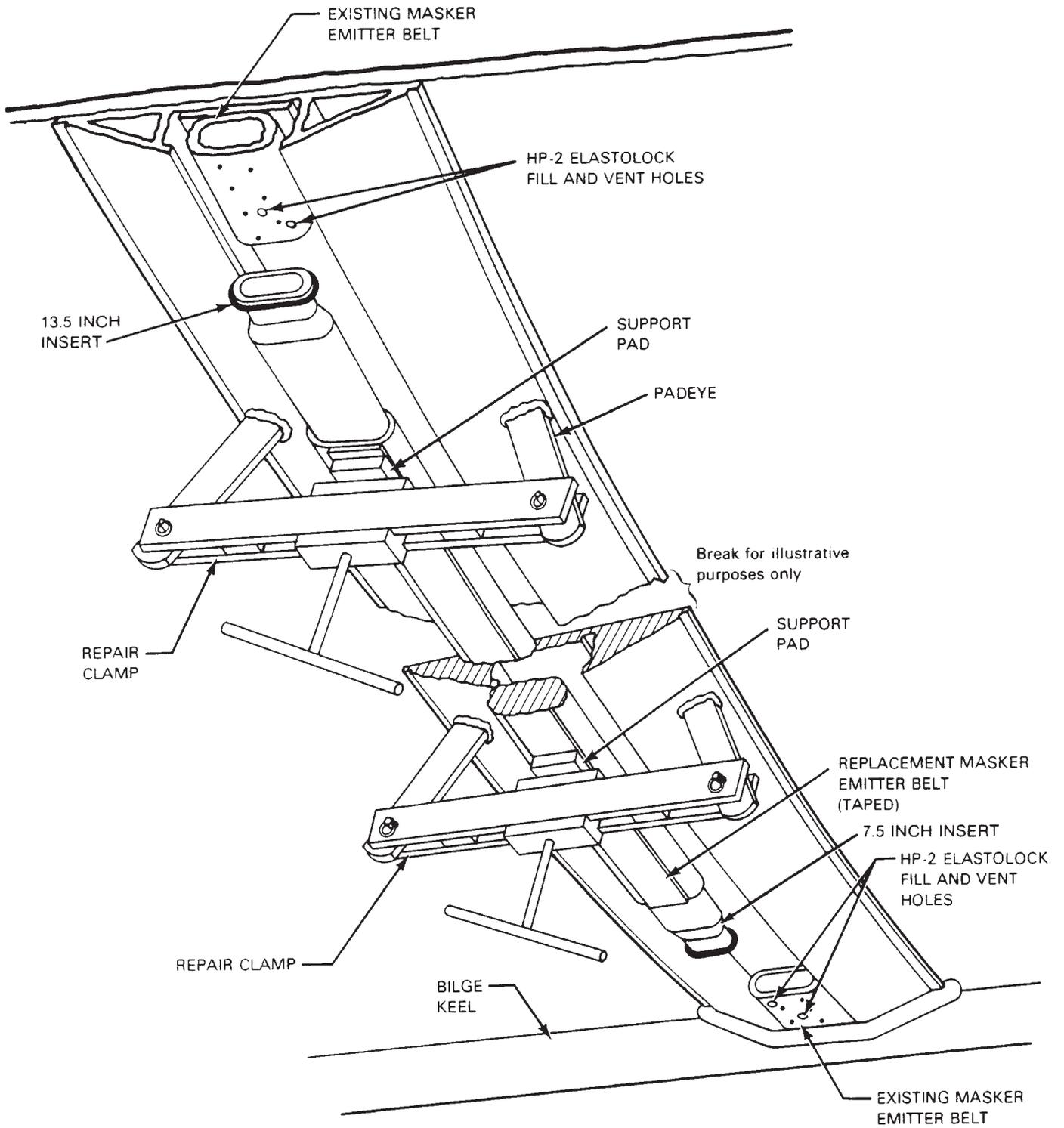


Figure 5-13. Replacement Section of Masker Belt Resting on Repair Clamp Support Pads, Procedure 2.

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5.8.48 (TOP) Prepare a final report documenting the accomplished repair.

Document should consist of Inspection Reports, Data Sheets, 35 mm still photographs, and video logs. Send copy of final report to NAVSEA 00C5.

5.8.49 (TOP) The final report shall include the quantities of all expendable material used to complete the job, details regarding any problems encountered, new or special tools needed, and modifications to tools or procedures.

FIND NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL
48	4		COMMERCIAL	NUT, 1/4 - 20 UNC-2B	CRES
47	4		COMMERCIAL	WASHER, 1/4 NOM.	CRES
46	4		COMMERCIAL	BOLT, 1/4 - 20 UNC-2A	CRES
45				FLATBAR, 3/16 THK	6061-T6 ALUM
44				PLATE, 3/16	A-36 STEEL
43			COMMERCIAL	COUPLING, 1-1/2	
42				TUBING, ROUND, 3/4 O.D. X .188 WALL	304 SST
41				STOCK, HEX, 1 INCH	304 SST
40	1	53711	-5	EXTENSION ASSEMBLY	304 SST
39	1	53711	-4	EXTENSION	304 SST
38	1	53711	-3	EXTENSION NUT	304 SST
37	1	42408	BUTTERWORTH P/N 31-09323-030 OR EQUIV	REPAIR KIT, FOR ZERO THRUST GUN (NOT SHOWN)	
36	1	42408	MCMASTER CARR #94 P/N 746711 OR EQUIV	HOSE NIPPLE DOUBLE MALE TYPE, 1/2" NPT x 3/4" NH	
35	1	29731	BUTTERWORTH P/N 431106-001 OR EQUIV	MALE ADAPTER FOR BLEED VALVE	
34	1	29731	BUTTERWORTH P/N 412031-001 OR EQUIV	BLEED VALVE	
33	1	53711	-2	MASKERBELT GUIDE	
32	4	29731	BUTTERWORTH P/N 44-08410-030 OR EQUIV	NOZZLE, STRAIGHT (2 NOT SHOWN)	
31	1	29731	BUTTERWORTH P/N 31-9300-524 OR EQUIV	ZERO THRUST GUN	
30	1	29731	BUTTERWORTH P/N 431547-001 OR EQUIV	SAFETY SHROUD	
29	1		COMMERCIAL	BUSHING, 1" FEMALE TO 1-1/2" MALE NPT	BRASS
28	1 SET		KTEC P/N 56F	PIN FILE	
27	1		GENERAL P/N 93	ADJUSTABLE PIN VICE	
26	1	53711	-1	VALVE PLATE	STEEL
25	1		COMMERCIAL	PIPE NIPPLE 1-1/4" x 2" LONG	BRASS
24	1		COMMERCIAL	1-1/2 TO 1-1/4 BELL REDUCER	BRASS
23	1	42408	HARGROVE P/N 350-1/16 OR EQUIV	PIN PUNCH	
22	1	42408	TAYLOR-PARKER OR EQUIV	TOOL BOX, 16", WITH TRAY (NOT SHOWN)	H.D. PLASTIC
21	1	42408	BUTTERWORTH P/N 431106-001 OR EQUIV	MALE ADAPTER (FOR SWITCH)	
20	1		COMMERCIAL	PIPE TO FIRE HOSE, FEMALE TO MALE FITTING	
19	1		COMMERCIAL	FIRE HOSE TO PIPE, FEMALE TO MALE FITTING	
18	1		COMMERCIAL	WIRE BASKET COVER (NOT SHOWN)	FACELON 18 oz
17	1	42408	SIGMA INDUS. P/N 540-324028-CS OR EQUIV	WIRE BASKET (NOT SHOWN)	GALV
16	7	29731	BUTTERWORTH P/N 411449-001 OR EQUIV	LOCKING PIN FOR LANCE NOZZLE (6 NOT SHOWN)	
15	1	29731	BUTTERWORTH P/N 4WSK 1414-1 OR EQUIV	PRESSURE SWITCH-SAF-TOL "E"	
14	8	29731	JIM-BUOY P/N 1502 OR EQUIV	HOSE, FLOATS MODIFIED (7 NOT SHOWN)	
13	1	29731	BUTTERWORTH P/N 431516-037 OR EQUIV	FLEXIBLE LANCE 10,000 W.P. 1/2" O.D x 37'	
12	1	29731	BUTTERWORTH P/N 434536-001 OR EQUIV	AMERICAN WATER BLASTER MODEL WBD-150N	
11	1	8D060	RICHMOND RUBBER OR EQUIV	FITTING, MALE, 1-1/2" FIRE HOSE	BRASS
10	1	8D060	RICHMOND RUBBER (IMPERIAL 7056) OR EQUIV	FIRE HOSE, 1-1/2" x 50'	
9	2	8D060	RICHMOND RUBBER OR EQUIV	FITTING, FEMALE, FIRE HOSE, 1-1/2"	BRASS
8	1	8D060	RICHMOND RUBBER OR EQUIV	FITTING, FEMALE, 1-1/2" NPT	BRASS
7	1	8D060	RICHMOND RUBBER (IMPERIAL 7056) OR EQUIV	FIRE HOSE, 1-1/2" x 100'	
6	1	39428	PENBERTHY P/N A-1-1/2", B-1" OR EQUIV	EJECTOR	BRONZE
5	2	29731	BUTTERWORTH P/N 433814-001 OR EQUIV	NOZZLE, SELF PROPELLING, FOR FLEXIBLE LANCE	
4	6	29731	BUTTERWORTH P/N 410518-001 OR EQUIV	HOSE, 10,000 W.P. 1/2" x 50' (4 NOT SHOWN)	PREMIUM RUBBER
3	1	29731	BUTTERWORTH P/N 431138-001 OR EQUIV	ADAPTER, FOR FLEXIBLE LANCE, 1/4	
2	8	29731	BUTTERWORTH P/N 431049-001 OR EQUIV	COUPLING ASSEMBLY, SCREW TYPE, SET (M,F)	
1	1	29731	BUTTERWORTH P/N 431931-001 OR EQUIV	FOOT CONTROL GUN	
FIND NO.	QTY REQD	CAGE CODE	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	MATERIAL

PARTS LIST					
UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES GENERAL TOLERANCES:		PHILLIPS CARTNER AND COMPANY INC. P.O. BOX JK WILLIAMSBURG, VA. 23187-8792		SITE LOCATION: WAREHOUSE # 12 CHEATHAM ANNEX WILLIAMSBURG, VA. 23185	
XX DECIMALS	XXX DECIMALS	ANGLES		DEPARTMENT OF THE NAVY NAVAL SEA SYSTEMS COMMAND WASHINGTON, D.C. 20362	
± .10	± N/A	± N/A			
REMOVE BURRS AND BREAK SHARP EDGES .03 MAX. INSIDE CORNERS R. .03 MAX. SURFACE ROUGHNESS: 125 ✓					
MATERIAL: AS NOTED					
APPROVED		J. KELLY	1/27/95	MASKERBELT CLEANING KIT	
ENGINEER		J. KELLY	1/27/95		
CHECKED		R. NAZARETH	1/27/95		
DRAWN		K. SPEED	4/23/91		
NAVSEA APPROVAL:		DATE:		SIZE	
ALAN TREVARTHEN		2/21/95		F	
INTERPRET DRAWING IAW DDD-STD-100		CONTRACT NO. N00024-89-C-4012		CAGE CODE	
DO NOT SCALE THIS DRAWING		SCALE: NONE		53711 199	
		2		DRAWING NO.	
		1		6699567	
				REV	
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				SHEET 1 OF 2	
				CADD	

Figure A-1. Bill of Materials, NAVSEA Drawing 6699567.

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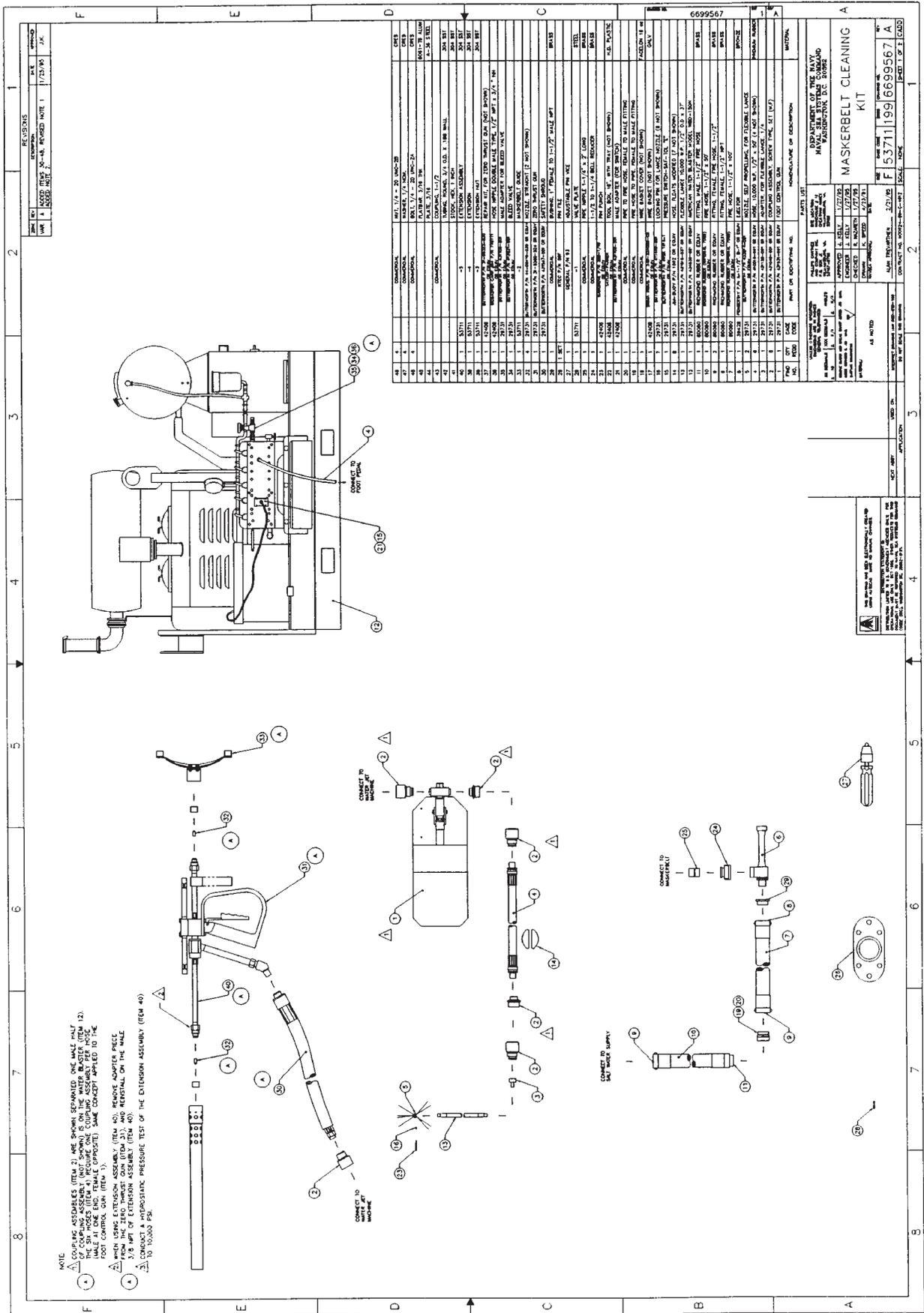


Figure A-2. NAVSEA Drawing 6699567, Masker Belt Cleaning Kit.

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